VOL. XXXIII. PART 12 DECEMBER, 1954

THE REVIEW OF APPLIED MYCOLOGY

RECENT PUBLICATIONS

A MANUAL OF RICE DISEASES
By G. Watts Padwick
Price £1. 10*s*.

THE BRITISH SMUT FUNGI (USTILAGINALES)
By G. C. Ainsworth and Kathleen Sampson
Price £1.

LEAF CURL DISEASE OF COTTON
By S. A. J. Tarr
Price 12*s*. 6*d*.

USTILAGINALES OF INDIA
By B. B. Mundkur and M. J. Thirumalachar
Price £1.

INDEX OF FUNGI
Petrak's Lists:
No. 1 for 1920, *Price* 10*s*.
No. 2 for 1921, *Price* 10*s*.
No. 3 for 1922–8, *Price* £2.
No. 4 for 1929, *Price* 10*s*.
No. 5 for 1930, *Price* £1. 5*s*.
No. 6 for 1931, *Price* 10*s*.
No. 7 for 1932–5 (original copies), *Price* £2. 5*s*.
No. 8 for 1936–9, *Price* £1. 10*s*.
Vol. I. Cumulative Index. *Price* £1. 5*s*.

For recent Mycological Papers and other publications, see pp. ii and iii of the cover

THE COMMONWEALTH MYCOLOGICAL INSTITUTE
KEW, SURREY

Price 5s. net

COMMONWEALTH MYCOLOGICAL INSTITUTE

EXECUTIVE COUNCIL: W. F. C. MORTON (*Chairman*), Union of South Africa; J. E. C. COVENTRY, B.A., M.Sc. (*Vice-Chairman*), Federation of Rhodesia and Nyasaland; B. C. ENGHOLM, United Kingdom; Lieut.-Col. J. G. ROBERTSON, B.S.A., F.R.S.A., Canada; W. IVES, M.Ec., Australia; V. ARMSTRONG, B.Sc., Ph.D., D.I.C., New Zealand; P. N. HAKSAR, Counsellor (External Department) of the High Commissioner for India in the United Kingdom, India; A. M. CHOWDHURY, Pakistan; A. I. PERERA, C.B.E. (for H.E. The High Commissioner for Ceylon), Ceylon; C. E. LAMBERT, C.M.G., Colonial Territories.

Secretary: Sir HERBERT HOWARD.

STAFF: *Director and Editor*: S. P. WILTSHIRE, M.A., D.Sc. *Assistant Director*: H. A. DADE, A.R.C.S. *Mycologist*: E. W. MASON, M.A., M.Sc. *Senior Assistant Mycologist*: G. R. BISBY, Ph.D. *Assistant Editors*: J. C. F. HOPKINS, D.Sc., A.I.C.T.A.; GRACE M. WATERHOUSE, M.Sc.; *Assistant Mycologists*: M. B. ELLIS, Ph.D.; C. BOOTH, M.Sc.; AGNES H. S. BROWN, Ph.D. *Sub-Editor*: D. JEAN STAMPS, Ph.D. *Colonial Pool of Plant Pathologists*: R. A. ALTSON, B.Sc., A.R.C.S.; B. E. J. WHEELER, Ph.D.

SULPHATE OF COPPER

98/100% PURITY

CRYSTALS AND POWDER

FUNGUS DISEASES

Control and prevent by spraying with Bordeaux Mixture made with the best quality Sulphate of Copper.

COPPER DEFICIENCY

Sulphate of Copper in powder form is also widely used for the correction of Copper Deficiency of the soil and in animal nutrition.

BRITISH SULPHATE OF COPPER ASSOCIATION LTD.

1 GREAT CUMBERLAND PLACE, LONDON, W.1

Telegrams: BRITSULCOP, WESPHONE, LONDON

Telephone: PADDINGTON 5068/9

A DICTIONARY OF THE FUNGI

By G. C. AINSWORTH and G. R. BISBY

Fourth edition now available

viii+475 pp., 10 plates, 20*s*., post free.

AN INTRODUCTION TO THE TAXONOMY AND NOMENCLATURE OF FUNGI

By G. R. BISBY

Second edition now available

vii+143 pp., cloth, 10*s*., post free.

MIMEOGRAPHED PUBLICATIONS OF THE COMMONWEALTH MYCOLOGICAL INSTITUTE

No. 6. Generic names of fungi proposed for rejection. *By G. R. Bisby*, 59 pp., 1949. *Price* 3*s*. 6*d*.
No. 7. Bibliography of systematic mycology, 1948. 34 pp., 1949. *Price* 2*s*.
No. 8. Bibliography of systematic mycology, 1949. 28 pp., 1950. *Price* 2*s*.
No. 9. Bibliography of systematic mycology, 1950–1951. 42 pp., 1952. *Price* 3*s*.
No. 10. Bibliography of systematic mycology, 1952. *Price* 3*s*.

COMMONWEALTH MYCOLOGICAL INSTITUTE

C. A. B.
5 JAN 1955
FILE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XXXIII DECEMBER 1954

McKEEN (C. D.). **Inhibition of virus infections of certain plants by extracts from Capsicum frutescens L.**—*Science*, 120, 3110, p. 229, 1954.

In work at the Science Service Laboratory, Harrow, Ontario, when sap from the leaves of chilli pepper (*Capsicum frutescens*) infected by cucumber mosaic virus was rubbed on the primary leaves of cowpea previously dusted with carborundum, a few discrete, reddish, local lesions (average of 0·4 in five tests) developed, and frequently none appeared. Inoculum from infected Burley tobacco plants, however, gave an average of 150·6 lesions in the five tests, every inoculated leaf being infected.

When a few drops of healthy chilli extract were added to sap from infected tobacco and assays were made on cowpea and *Chenopodium hybridum*, the average number of lesions (in six tests) per cowpea leaf was 7·9, compared with 220·7 for unadulterated sap, the corresponding figures for *C. hybridum* being 10·2 and 133.

Similar inoculations with two strains of tobacco ring spot virus from tobacco and cucumber, respectively, demonstrated that chilli extract almost entirely inhibited local lesion development on cowpea and *C. hybridum* and reduced it on tobacco.

The percentage of successful transmissions of tobacco etch virus [*R.A.M.*, 33, p. 402] obtained by rubbing the leaves of *Physalis peruviana* with sap from infected chilli was small compared with transmissions from tobacco, and the addition of chilli extract reduced the numbers of primary lesions on Burley tobacco to one-seventh or one-eighth of the numbers given by viruliferous tobacco sap alone.

Viruskrankheiten der Kulturpflanzen. [Virus diseases of cultivated plants.]—*Pflanzenarzt*, 7, 3 (special issue), 11 pp., 4 figs., 1954.

The first paper of this symposium is by H. WENZL on virus research (pp. 1–4); the author discusses the nature of viruses, the damage done by them, their transmission, the symptoms of plant viruses, and control measures. He states that protective inoculation with 'mild' viruses has given no practical results yet, and that only indirect control measures are available.

H. WENZL, dealing with old and new features of the control of potato virus diseases (pp. 4–5), considers that constant level of crop production by using resistant varieties should be the main aim in potato-growing today. The Austrian varieties Böhms Mittelfrühe, Frühbote, Ostbote, and Roswitha vary in resistance with geographical conditions and the degree of virulence of the virus; all-round resistant varieties are Aquila, Forelle, Panther, Maritta, and Niederarnbacher. Practical advice is given on the production of healthy seed potatoes.

Most of the information on the virus diseases of beet in Austria (pp. 5–6) by the same author has been noticed from other sources [*R.A.M.*, 33, p. 460].

TRUDE SCHMIDT, dealing with virus diseases in Austrian vegetable culture (pp. 6–8), only a few of which are of economic importance, states that in 1953 they caused more damage than usual. The greatest loss was due to yellow streak virus

disease of onion [onion yellow dwarf: 33, p. 575], the symptoms of which are described in detail. Cayenne [chilli] pepper is susceptible to virus-dwarfing. Ornamental plants (pp. 8–9) suffer from even more virus diseases than vegetables. Of these may be mentioned yellow spot of *Pelargonium*, transmitted by aphids, and mosaic of primulas and asters.

R. FISCHER, writing on virus diseases of fruit (pp. 9–10), considers that the system of small scattered orchards is the probable reason why virus diseases play a lesser role in Europe than in the United States. Pfeffinger disease of cherry and plum pox have not yet been observed in Austria. Transmission, diagnosis, and symptoms of the diseases are discussed, and the observed virus diseases listed. Among stone fruits no disease has been diagnosed with certainty as virus-caused. The leaf-vein mosaic and rosette diseases of apples are attributed to zinc deficiency and can be cured by fertilizing or spraying with zinc sulphate. Several diseases of berry fruits are suspected, but not yet proved, to be of a virus nature.

H. WENZL describes a new health test for seed potatoes (p. 11) invented in Holland.

Rapport Annuel de l'Institut National de la Recherche Agronomique, 1951. [Annual Report of the National Institute for Agronomical Research, 1951.]—250 pp., 26 figs., 1 map, 1954.

The items of phytopathological interest in this report [cf. *R.A.M.*, 33, p. 522] not already noticed from other sources include the following from the Central Research Station, Versailles (pp. 77–91). The transmission of the character for resistance to black rust [*Puccinia graminis*: 32, p. 121] from the wheat hybrid 80–3 is conditioned by a major dominant factor. Four years' observations have revealed ten barley varieties that are completely resistant to *Oidium* [*Erysiphe graminis*: cf. 33, p. 23]. Some lines of Mediterranean origin appear to have adequate practical resistance to *Puccinia simplex* [*P. hordei*: 26, p. 195]. Several varieties also appear to resist the two races of loose smut [*Ustilago nuda*: 25, pp. 63, 328] present in the vicinity of Paris. Some F_4 hybrids of Kenya with Bordia and Probstdorf barley are less susceptible to *U. nuda* than the two last-named parents.

In tests of wild *Solanum* species only one clone of seven *S. demissum* and also *S. polyadenium* remained free from *P*[*hytophthora*] *infestans* [32, p. 501]. Tetraploid mutants have been obtained from *S. polyadenium* with a view to crossing with *S. tuberosum*. Two years' studies at Versailles have revealed that viruses reduce potato yields by about 45 per cent. Four varieties which showed no leaf roll [24, p. 471] in conditions favourable to infection reacted in grafting experiments. X 32 and Shamrock appeared to have some degree of field resistance while Ronde jaune du Tregor was fairly tolerant.

In inoculation experiments to discover the effect of diseases on yields of Svalöfs Olajlin, Pervenche, and Lin de Valachie linseed the figures were (taking the uninoculated control as 100) for *Polyspora* [*lini*: 33, p. 70] 100, 97, and 91 for the three varieties, respectively; *Ascochyta* [*linicola*: 28, p. 396] 93, 81, and 73; and pasmo [*Mycosphaerella linorum*: C.M.I. map No. 18] 95, 77, and 67.

Experiments were conducted in the laboratory or by means of natural, heavy soil infestations to obtain purple clover plants resistant to *Sclerotinia trifoliorum* [*R.A.M.*, 32, p. 486]. The seed of the survivors was tested in a similar manner, resistant plants were selected and crossed with those of similar habit with a view to obtaining suitable inbred lines.

It is reported from the Plant Improvement Station, Montpellier (pp. 105–112), that the north American wheat varieties Canus, Saunders, Frontana, Redman, Regent, Renown, and Comanche and the south American Petirrojo and Estanzuela 3352 reacted well in conditions favouring black rust and brown [*P. triticina*] and are to be used for breeding. Certain lines among the F_3 oat crosses Mindag×

Romana, Richland × Rouge d'Afrique, and (in F_4) Richland × (Z 94 × Prieuré) 54 and Richland × (Z 94 × Prieuré)III suffered only slightly from crown rust [*P. coronata*: 25, p. 388].

In the plant pathology section from Versailles (pp. 122–128) it is stated that in *in vitro* experiments trichothecin [29, p. 631] inhibited spore germination completely in *Endothia parasitica* and *Ustilago zeae* at 10γ, *Phoma betae* and *Helminthosporium sativum* at 20γ, and *Fusicladium pirinum* [*Venturia pirina*] at 100γ. Soil treatment with *Penicillium claviforme* plus maize meal reduced *Phoma lingam* on colza from 69 per cent. (control) to 4 per cent. Trichothecin at 100γ and the filtrate of *Trichothecium roseum* [cf. 31, p. 244] used as seed treatments reduced *P. lingam* on colza from 88 to 10 and 14 per cent., respectively. The culture liquid of *T. roseum* prevented barley mildew [*Erysiphe graminis*] from developing for about 15 days. An irritant extract was highly effective at 25 mg. per l. Potato scab [*Actinomyces scabies*] was reduced by using a green manure (colza) or spreading ammonium sulphate [on the soil: cf. 32, p. 587]. Seed treatment with thiram or dichloronaphthoquinone reduced the incidence of *Alternaria brassicae* [33, p. 70] on colza but preventive treatments in May are necessary to protect the aerial organs.

From the Botany and Plant Pathology Station, Antibes (pp. 128–130), it is reported that *Rhizoctonia* [*Corticium*] *solani* [32, p. 562] and *Vermicularia* [*Colletotrichum*] *dianthi* [cf. 22, p. 241] cause premature wilt of carnations in this area. The former attacks the roots and stem bases and can kill cuttings or adult plants. The latter is a vascular parasite. *Sclerotium rolfsii* [30, p. 418] caused an important basal rot of seed-bed carnations at Caiqueiranne, in the Var. Rot of gladiolus corms imported from Holland was attributed to *Fusarium oxysporum* var. *gladioli* [30, p. 107]. Soil humidity was found to play an important part in jasmine root rot (*Rosellinia necatrix*), the optimum for infection being two-thirds of the water-holding capacity. Of 15 species tested two showed marked resistance and may be used as stocks for *J*[*asminum*] *grandiflorum*.

Work at the Plant Pathology Station of the South-West (pp. 130–132) demonstrated the effectiveness of spring sprays with wettable sulphur against moniliasis [*Sclerotinia* ? *fructigena* and *S.* ? *laxa*: 29, p. 313; 33, p. 161] of stone fruits. The disease is increasing in certain parts of the south-west. Phygon applied at 200 gm. per hl. five times after flowering has given satisfactory protection against apple and pear scab [*Venturia inaequalis* and *V. pirina*: 29, pp. 157, 570; 33, pp. 159, 677]. Incidence of maize ear rot due to *Gibberella zeae* [cf. 30, p. 607] reached 8 per cent.

Studies at the Plant Pathology Station, Colmar (pp. 132–133), revealed that the yellow dwarf virus [31, p. 99] reduced onion seed yields by about 55 per cent. (weight of the sifted, unwashed seed) and bulb weight in white onions by 40 per cent., in shallots by 70 per cent., and in leeks by from 17 to 45 per cent. according to symptom severity.

It is reported from the National Agronomical Institute (pp. 134–135) that *Diaporthe perniciosa* is serious on pear and apple trees [cf. 31, p. 477]. Incidence has been reduced in certain Anjou nurseries by burning diseased seedlings, by scion selection to eliminate those bearing lesions near the union, by protecting pruning wounds, and by injecting neutral orthoxyquinoline sulphate [27, p. 531].

Studies by [L.] Guyot on cereal rusts at the National School of Agriculture, Grignon (pp. 135–138), revealed that races 21 and 40 of *Puccinia graminis* [32, p. 121] were present there, 14 at Montpellier, and 17 both at Montpellier and in the Vaucluse. This rust did not assume its usual virulence owing to its late appearance. The new [? wheat] variety Étoile de Choisy was highly resistant to the strains of races 14, 17, and 21 tested, but highly susceptible to the four of race 40 isolated for the first time in 1951. Studies by [J.] Guillemat demonstrated that *Corticium solani* [29, p. 11] is more pathogenic to potato in Breton soils than in those near

Paris, since sandy or acid soils favour the pathogen. Formalin applied as an aerosol gave promising results for tuber treatments.

CICCARONE (A.). **Note fitopatologiche. II. Segnalazione italiana della Peronospora della Trigonella (Trigonella foenum-graecum L.). III. Osservazioni intorno ad epifizie di Peronospora pisi (De By.) Syd. nel Casertano.** [Phytopathological notes. II. Italian report of the *Peronospora* of *Trigonella* (*Trigonella foenum-graecum* L.). III. Observations on outbreaks of *Peronospora pisi* (de Bary) Syd. in Caserta.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 10 (*1952*), pp. 31–34, 35–37, 1 fig., 1953. [English summaries.]

The information in these papers on infection of *Trigonella foenum-graecum* by *Peronospora trigonellae* and of peas by *Peronospora pisi*, both in Italy, has already been noticed from another source [*R.A.M.*, 31, p. 514; 32, p. 233].

WILTSHIRE (S. P.). **Plant diseases in British Colonial Dependencies : a half-yearly report.**—*F.A.O. Pl. Prot. Bull.*, 2, 5, p. 65, 1954.

In Dominica withertip of limes (*Gloeosporium limetticola*) [*R.A.M.*, 26, p. 145; cf. 32, p. 250] is still confined to certain ecological zones where conditions, particularly altitude, favour infection. Slight variations in occurrence are attributed to weather conditions. Proper cultural practices lead to greatly reduced losses. Red root of limes [32, p. 251], sometimes associated with *Sphaerostilbe repens* [22, p. 355], has been successfully controlled by the gradual replacement of the seedling limes by budded material grown on highly resistant or immune stocks. Banana leaf spot (*Mycosphaerella musicola*) [33, p. 590] is present in all parts of the island, but is less severe near the coast.

In Grenada root disease (*Rosellinia pepo*) of nutmeg [21, p. 162] was present during the period under review. Incidence of cacao witches' broom (*Marasmius perniciosus*) [33, p. 411] showed an over-all reduction.

FOSTER (W. R.) & MACSWAN (I. C.). **Report of Plant Pathology Branch.**—*Rep. B.C. Dep. Agric., 1952*, pp. CC56–CC61, 1953.

In this report [cf. *R.A.M.*, 32, p. 173] it is stated that apple scab [*Venturia inaequalis*: 33, p. 467] has suddenly become severe in the Southern Okanagan area of British Columbia, reaching epidemic proportions after wet weather on 22nd and 23rd July. The results of spraying tests at Creston and Procter indicated that both crag and orthocide [captan] merit further trial.

Physiological disorders of fruit trees caused by deficiencies of zinc, manganese, and magnesium [32, p. 667] appear to be increasing in the Okanagan. Preventive sprays of manganese sulphate and zinc oxide, each at 2 lb. per acre, and magnesium sulphate at 20 lb. are recommended, either singly or combined. A late dormant spray of 40 lb. zinc sulphate per acre is advised for severe zinc deficiency. Symptoms of boron deficiency, once widely prevalent, are seldom seen, but boron toxicity is becoming more common; this is least likely to occur when boron is applied as a foliar spray, since the amount received by a young tree is limited by its size.

Plum black knot [*Dibotryon morbosum*: 32, p. 173] has been considerably reduced in the Chilliwack-Sardis-Rosedale area since the 1950 survey. In the Creston area little cherry [32, p. 173; 33, p. 139] caused less damage than in any year since it first became widespread. The most severely affected trees were newly infected ones; most of the previously infected trees now appear virtually normal. Pear fire blight [*Erwinia amylovora*: 33, p. 609] declined considerably. Applications of 1–1–100 Bordeaux in ordinary sprayers or in concentrates at 3–3 per acre are recommended at 10 per cent. full bloom and again at full bloom. At Creston spraying $\frac{1}{2}$–$\frac{1}{2}$–100 Bordeaux at 48-hour intervals at blossoming gave very promising

results. *Coryneum* blight of apricots and peaches [*Clasterosporium carpophilum*: 32, p. 173] was more serious and widespread than usual in the Summerland and Naramata districts of the Okanagan, probably because growers failed to spray during the previous two years, when there was little or no fruit. In the Chilliwack area this disease remains a major problem of peach production. Spray trials indicated that the most effective times for applications are in October and November. For the first time powdery mildew [*Podosphaera oxyacanthae*] affected cherry fruits in the Southern Okanagan [cf. 26, p. 550].

Two tests are being conducted in the Fraser Valley to determine whether soil treatment with dithane D-14 will control strawberry red stele [*Phytophthora fragariae*: 32, p. 173]. Strawberry powdery mildew [*Sphaerotheca humuli*: 18, p. 191; 30, p. 15] was unusually severe on the Coast. Washington raspberries were attacked with exceptional severity by yellow rust [*Phragmidium rubi-idaei*: 28, p. 444], though the Newburgh and Willamette varieties were not seriously affected. When blueberries [*Vaccinium*] were sprayed on (1) 25th April, 1952, only, (2) 13th October, 1951, only, or (3) 15th September, 13th October, 1951, and 25th April, 1952, with 10–10–100 Bordeaux the numbers of canes killed by *Godronia* canker [*G. cassandrae*: 32, p. 174] were respectively, 4, 9, and 6, as against 16 for the unsprayed.

The Moscow tomato variety showed some resistance to *Verticillium* wilt [*V. albo-atrum*: 32, p. 666 and next abstract]. [Beet] curly top virus was reported on tomatoes for the first time at Ashcroft, where 30 per cent. of the plants were affected in one 40-acre field, and at Kamloops, where slight infection was present in three fields.

Potato bacterial ring rot [*Corynebacterium sepedonicum*: 31, p. 512; 32, p. 174] occurred in one field of the White Rose variety on Lulu Island, in the Fraser Valley; the incidence (about 15 per cent.) was the highest recorded in this locality. The disease was also present in two carloads of potatoes from Alberta, one from Manitoba, and two from Washington.

Conners (I. L.) & Savile (D. B. O.). **Thirty-second Annual Report of the Canadian Plant Disease Survey, 1952.**—xviii+123 pp., 1953. [Mimeoprinted.]

In the section of this report [cf. *R.A.M.*, 32, p. 542] dealing with new or noteworthy diseases (pp. ii–v) [also given in French] it is stated that in 1952 *Puccinia glumarum* was unusually prevalent on wheat and barley in southern Alberta. *P. secalina* [*P. dispersa*] was widely distributed on rye across the southern part of the Prairie Provinces. Race 15 B of *P. graminis* [33, p. 663] was widespread on wheat in Ontario and Quebec.

Digitalis lanata in British Columbia was attacked for the first time in Canada by leaf spot (*Colletotrichum fuscum*) [cf. 33, p. 502] and crown rot (*Pythium* sp.).

For the first time since the Survey was initiated, potato blight (*Phytophthora infestans*) [33, p. 139] was reported simultaneously from every province in Canada; tuber rot was severe in Quebec and Nova Scotia. In trials in Newfoundland, Kennebec was highly resistant to *Synchytrium endobioticum* [loc. cit.]. Observations confirmed the importance of using seed free from *C. lindemuthianum* [cf. 31, p. 372] and *Pseudomonas* [*medicaginis* f.sp.] *phaseolicola* [30, p. 15] in the production of beans [*Phaseolus vulgaris*]. The Burpee hybrid cucumber, for several years highly resistant to *Cucumis* virus 1 [cucumber mosaic virus: 33, p. 700], has recently displayed little resistance to strains now present. Improved Bay State appears to be the only tomato variety still resistant to *Cladosporium fulvum* [30, pp. 16, 20, 250 and below, p. 767] in south-western Ontario. In the interior of British Columbia 55 per cent. of the tomato plants were affected by *Verticillium albo-atrum* [see preceding abstract], the estimated loss of yield being 6·6 per cent., or 2,725 tons.

Pear scab (*Venturia pirina*) [20, p. 6] caused heavy losses in some orchards in the

Niagara Peninsula, Ontario. Surveys in the Okanagan Valley, British Columbia, confirmed the view that sweet cherry trees are resistant to crown rot (*Phytophthora cactorum*) [33, pp. 240, 609], only 33 of 4,615 being infected. In the Niagara Peninsula the percentage of trees affected by one or more virus diseases in the sweet cherry orchards surveyed had increased to 70·2 and in the sour cherry to 56·6 [33, p. 139]. *V. albo-atrum* attacked young stone-fruit trees and raspberry plantings [cf. 31, p. 337], occurrence in some cases being associated with affected vegetable crops. Raspberries in British Columbia were attacked by two virus diseases new to the locality, severe leaf curl [cf. 32, p. 387], apparently a new disease, and vein chlorosis [31, p. 614].

New or rare diseases of ornamentals included downy mildew (*Peronospora antirrhini*) of *Antirrhinum majus* [31, p. 553] in Alberta, yellows virus of China aster from Ile-à-la-Crosse in northern Saskatchewan, rust (*Puccinia chrysanthemi*) on chrysanthemum cuttings from Leamington, Ontario, in a greenhouse at Montreal, also reported from British Columbia [C.M.I. map No. 117], *Curvularia lunata* affecting gladiolus corms in Montreal, *Phyllosticta hydrangeae* on *Hydrangea*, now known from Quebec and Winnipeg, *Chrysomyxa piperiana* [cf. *R.A.M.*, 30, p. 124] on *Rhododendron californicum* in British Columbia, and *Alternaria zinniae* [cf. 31, p. 239] on zinnia at Kentville, Nova Scotia.

Report of the Division of Mycology and Plant Pathology.—*Sci. Rep. agric. Res. Inst. N. Delhi, 1950–1951*, pp. 89–99, 1953. [Received February, 1954.]

In the plant pathology section of this report [cf. *R.A.M.*, 32, p. 543] R. S. Vasudeva notes that the analysis of wheat rust collections from all over India during the period [cf. 33, p. 415] revealed that races 21 and 42 of black rust [*Puccinia graminis*: loc. cit.], races 63 and 20 of brown rust [*P. triticina*: loc. cit.], and races 19 and A of yellow rust [*P. glumarum*: loc. cit.] were predominant and widely distributed. Other races found were *P. graminis* 40 and 34, *P. triticina* 106, 108, and D, and *P. glumarum* 20, 31, A, E, and H. In seedling varietal resistance tests [loc. cit.] Simla hybrids 77, 79, 115, and 165 and exotic hybrids E. 572, 579, 581, and 593 were resistant to all nine Indian races of *P. graminis* tested individually, while varieties E. 336, 505, 569, 592, 741, 744, 874, 875, 877, 879, 909, 910, 924, 931, 940, and 951, fixed hybrids W. 206, plants 4, 9, and 40, and W. 246, plants 8, 9, 18, 38, and 41, were resistant to a mixed inoculum of nine races. Varieties E. 147, 620, 627, 630, 671, 672, and 687 gave a resistant reaction to all 10 races of *P. glumarum* tested individually, and E. 336, 446, 555, 740, 928, and 938 to a mixed inoculum of all. Varieties E. 699, 928, 938, 956, and 957 were resistant to a mixed inoculum of 8 races of *P. triticina*, while E. 80 was resistant when they were used individually. E. 952 was the only variety resistant to all 27 races (mixed) in the seedling stage though several were resistant in the adult stage. A loss of about 30 per cent. was sustained in the wheat crop near Delhi, from tundu disease, *Corynebacterium tritici* [32, p. 618 and next abstract].

In assessing rust resistance in barley varieties only B. 216 was found to be resistant in the seedling stage to all 10 races of *P. glumarum* (mixed inoculum), while none was resistant to *P. graminis*. At maturity eight barley varieties were resistant to all races of *P. glumarum*.

In a plot test incidence of barley loose smut (*Ustilago nuda*) was completely controlled by solar treatment [29, p. 555; cf. 33, p. 594] though germination was reduced from 96 to between 80 and 90 per cent.

During the season under review 94 parent sugar-cane varieties were tested for resistance to *Colletotrichum falcatum* [*Physalospora tucumanensis*: 33, p. 562] by the plug method. Of these, 59 were moderately resistant and four very resistant; the latter were also resistant to nodal infection. *Puccinia kuehnii* [loc. cit.] was prevalent on Co. 475 in Bombay State. Of 181 varieties inoculated, 26 exhibited

less than 5 per cent. infection with smut (*Ustilago scitaminea*) [33, p. 633]. The maximum experimental infection on Delhi and Karnal was 90 to 100 per cent., so the 26 varieties may be considered as highly resistant.

In tests of 20 varieties of pigeon pea for resistance to *Fusarium udum* [32, p. 544] in infested soil and inoculated soil in pots, N.P. 41, C. 38–1–2, and D 419–2–4 were highly resistant in both tests.

In tests of 1,562 linseed hybrids for resistance to rust (*Melampsora lini*) [loc. cit.] 104 proved to be immune or resistant in both the seedling and adult stages, while seven were fairly resistant.

Assessments of the damage to various crops by diseases showed that the yield of the wheat variety Agra Local bearing 10 to 25 or 40 to 50 per cent. *P. graminis* infection was reduced by 14·2 and 19·6 per cent., respectively. The corresponding reductions for N.P.4 were 7·9 and 13·1 per cent. No plants with 75 per cent. infection or over were found, owing to the late appearance of *P. graminis*. Linseed yield reductions due to *M. lini* in six varieties ranged from 3·1 to 20·4 per cent. for 40 to 50 per cent. infection. The sugar-cane varieties Co. 312 and Co. 313 suffered 15·5 and 41·8 per cent. reduction in yield, respectively, when the setts were inoculated at planting time with *U. scitaminea*. The losses were 71 and 73·3 per cent. when setts from smutted canes were used.

The average yield of tomato plants was reduced by 66 per cent. by [tobacco] leaf curl [virus: cf. 29, p. 61].

An examination of diseased potatoes from Madras and Bombay States for ring rot (*Corynebacterium sepedonicum*) [31, p. 574] revealed only *Pseudomonas solanacearum* [loc. cit.].

In the plant viruses section it is recorded that attenuation of tobacco leaf curl virus has been brought about by passage through chilli (*Capsicum annuum*) [cf. above, p. 705] and by successive passage through tomato and *Datura*. Sap from *Crotalaria juncea* plants infected by the phyllody virus [32, p. 545] has been shown to remain infective for 370 days at 6° to 8° C.

Report of the Directorate of Plant Protection, Quarantine and Storage for the period 1946–1951.—44 pp., Delhi, Government of India Press, 1953.

In the section of this report devoted to plant diseases and weed control (pp. 16–19) it is stated that the Bureau of Plant Diseases in Delhi State has reported that yellowing rot of wheat [*Corynebacterium tritici*: *R.A.M.*, 32, p. 472] is becoming severe in Delhi and U[ttar] P[radesh], up to 20 per cent. of the plants being affected in some fields [see preceding abstract]. Guava wilt [*Fusarium oxysporum* f. *psidii*: 31, p. 390] was severe in certain orchards in Delhi State.

A new disease of cumin, probably due to *Fusarium* sp., is causing damage in Ajmer-Merwara. The distribution of *Urocystis tritici* on wheat [33, p. 594] has increased to include Ajmer-Merwara. Quarantine measures have been introduced to restrict the spread of banana bunchy top virus [32, p. 325], which is increasing in the States of Orissa and Bombay, and against a new virus disease of guava.

Good control of the following diseases was obtained with 0·2 to 0·35 per cent. perenox: *Alternaria solani* on potatoes [32, p. 544] and brinjal [eggplant], *Cercospora hibisci* on bhindi [*Hibiscus esculentus*: 33, p. 277], *C. dolichi* on beans [*Dolichos*], and *Colletotrichum gloeosporioides* [*Glomerella cingulata*: see below, p. 720] and *Xanthomonas citri* on citrus [32, p. 183]. Dithane [Z-] 78 at 0·2 per cent. was superior to perenox in the control of *A. solani* on potatoes. Yellow cuprocide (0·2) was efficient against *A. solani*, *G. cingulata*, and *X. citri*.

Seed treatments in India are estimated to increase food production by five to 12 per cent. In the States of Bombay, Hyderabad, Ajmer, Delhi, Uttar Pradesh, and Punjab, over 1,000,600, 150,000, 106,466, 8,000, 703, and 200 maunds

[1 maund = 82·284 lb.], respectively, of jowar [sorghum] seed have been treated with agrosan GN [32, p. 176] or sulphur [33, p. 524].

Under a scheme to raise disease-free potato stocks, an area of 90 acres in Bihar State was kept free from diseases by regular spraying and roguing of virus-infected plants.

In an appendix to this report is a summary of the plant protection work being carried out in the Indian States.

Tenth Annual Report of the Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica, for the year 1952.—160 pp., 1953. [Mimeographed. Received September, 1954.]

In the Plant Industry section of this report (pp. 15–45) it is stated that the incidence of leaf infections by *Cercospora* [? *coffeicola*: *R.A.M.*, 31, p. 374; 32, p. 70] and possibly root attack by *Rhizoctonia* on coffee seedlings was greatly reduced by soil sulphur treatment at 1,500 kg. per ha.; at the end of the year this was the only treatment in which most of the plants were still alive and showing good growth, as opposed to those receiving other amendments of minor elements. According to Maria E. Peralta the leaves of plants suffering from 'café macho' in the Grecia region contained an average of 803·9 p.p.m. manganese and 15·2 p.p.m. zinc and healthy plants 165·7 and 20·9 p.p.m., respectively. Other tests seem to confirm that the disorder is due to manganese toxicity.

Lucy H. Gutiérrez states that seedling and nursery diseases have been a limiting factor in the production of healthy coffee trees. Early greenhouse tests demonstrated that losses from *Rhizoctonia* and *Cercospora* were reduced significantly by soil treatments with arasan and formaldehyde before planting. In an experiment in an unshaded coffee nursery G. M. Chaves and O. Fernández found that plants given weekly sprays of SR-406 [captan] or fermate for seven months developed vigorous growth and a low percentage of leaf infection by *Colletotrichum* and *Cercospora*. The other treatments were markedly poorer and the unsprayed controls were dead after five months. In further studies by Lucy H. Gutiérrez of the severe *Colletotrichum* die-back and leaf infections fermate again gave consistent and highly significant control in both nursery and commercial spray trials. Analyses during the past year indicated a positive correlation between heavy die-back incidence and rainfall.

E. H. Casseres states that 39 potato seedlings and the varieties Harford, Cortland, Kennebec, and Cornell DUA-2 from the United States showed a high degree of resistance to *Phytophthora infestans* [33, p. 176] and yielded well. Pentachlorophenol at 6 lb. in 100 gals. water per acre was excellent for killing haulms of mature plants.

N. Florence Thomas, in charge of bean [*Phaseolus vulgaris*] breeding, reports that a new black-seeded dry bean, Rico (IAIAS No. 2015), yielded well and showed a lower incidence of *Pellicularia* blight [*Corticium solani*: 21, p. 360; cf. 26, p. 334] than other varieties. It was increased and distributed for testing and further increase, and is being used for breeding.

According to Lucy H. Gutiérrez seed treatment of rice against seedling blight (*Helminthosporium oryzae*) [*Ophiobolus miyabeanus*: 31, p. 372] with granosan at 1·14 oz. per 100 lb. seed resulted in a yield increase of 41·4 per cent. In field inoculations for the three phases of the disease, losses from seedling infection were greater than from leaf or head infection. A variety which had shown marked resistance in the greenhouse was severely infected in the field, thus raising the question of the validity of the seedling reaction as a fair evaluation of resistance. Of 49 varieties studied for their seedling reaction, Berlin, Dourado Peludo × Fortuna, Dourado Agulha, and Kriviman Kotti showed marked resistance to heavy inoculation. Wide differences in physiology, pathogenicity, and general appearance were

observed in about 175 isolates of *O. miyabeanus* obtained from Central and South America.

Serious germination reductions in stored rice seed were found to be directly correlated with high percentages of *O. miyabeanus*. In tests on approximately 75,000 seeds viability was greatly prolonged and good condition maintained by drying to 9 per cent. moisture, treating with granosan or granosan M [31, p. 372] at 1 oz. per 100 lb., and storing in air-tight containers.

In field studies by J. R. Havis, Lucy H. Gutiérrez, and G. M. Chaves plots of Morado Blanca potatoes sprayed weekly with captan produced an average of 452 bush. per acre, biweekly sprays 281 bush. and the untreated 155 bush. The use of stickers conferred, on the whole, little improvement [33, p. 527].

In further studies on the mineral nutrition of cacao by P. de T. Alvim, G. F. Bowman, and F. García the following pod yields per plant over six months were recorded: (*a*) galvanized nails driven into the trunk, 46·7, (*b*) iron nails, 38·7, (*c*) zinc sulphate crystals placed in holes bored in the trunk, 51·1, and (*d*) no treatment, 34. Zinc deficiency therefore does exist at La Lola. P. de T. Alvim states that cherelle wilt [32, p. 70] was higher during periods when growth in diameter was low and growth flushes occurred, and extremely high in November following a period of heavy rain when girth increase was checked completely. R. G. Orellana found that leaf abscission resulted from infection by both *Phytophthora palmivora* [33, p. 526] and *Colletotrichum* sp., though the former was the more aggressive as it killed seedlings a few days after stem inoculation, produced die-back symptoms under field conditions, and canker symptoms on the woody chupons and fan branches, while *Colletotrichum* did not. Thiamine appears to be essential for growth and conidial production of *P. palmivora*. In a preliminary study the fungus remained viable and pathogenic for several months in inoculated sterilized and non-sterilized soils. The severity of infection of pod pieces was greater in sterilized, inoculated soil than in non-sterilized, indicating that survival may depend partly on competition with soil microflora. At least two infection types were obtained when pods from six United Fruit clones were inoculated with a conidial suspension of *P. palmivora*, indicating that there may be various levels of resistance to the pathogen in cacao. A new symptom of *P. palmivora* pod rot, observed in the Atlantic zone of Costa Rica, is a typical internal zonation of concentric brown and light bands which accompanies large, dark patches on the usual lesions.

Démétriadès (S.). **Action du bleu d'aniline et du rouge de chlorophénol sur la formation et la croissance des tumeurs de crown-gall.** [Action of aniline blue and chlorophenol red on the formation and growth of crown gall tumours.]—*C. R. Soc. Biol., Paris*, 147, 3–4, pp. 280–282, 1953.

The results of experiments at the Laboratory of Plant Physiology, Versailles, with normal and crown gall (*Agrobacterium* [*Bacterium*] *tumefaciens*) tissues of Jerusalem artichoke [*Helianthus tuberosus*: see next abstract], *Parthenocissus tricuspidata*, and *Scorzonera* [*R.A.M.*, 32, p. 474], confirmed the observations of Dimond and Stoddard [31, p. 106] as to the inhibition of tumour growth *in situ* by dyes, notably chlorophenol red and aniline blue. In the tests on *H. tuberosus* chlorophenol red (1 ml. of a $3{\cdot}6 \times 10^{-5}$ concentration) was injected into the stems over a period of 60 days.

There was no significant difference in the growth of healthy and gall tissues of *P. tricuspidata* and *Scorzonera* after 47 and 54 days, respectively, in pure culture, the former on Gautheret's medium containing 5 per cent. glucose with the addition to the normal material of naphthyl acetic acid (5×10^{-8}), and the latter on Heller's medium, when aniline blue ($3{\cdot}6 \times 10^{-5}$) was added. It is concluded that the dyes do not act specifically on the bacterium, but may affect the mechanism of transformation of normal into tumorous tissue.

Démétriadès (S.). **Sur l'action cancérigène de l'endotoxine de l'Agrobacterium tumefaciens.** [On the cancerigenous action of the endotoxin of *Agrobacterium tumefaciens*.]—*C. R. Soc. Biol., Paris*, 147, 3–4, pp. 282–283, 1953.

In further attempts to elucidate the mechanism of transformation by *Agrobacterium* [*Bacterium*] *tumefaciens* [see preceding abstract] of a normal into a tumorous plant cell, using as experimental material entire plants and tissue cultures of Jerusalem artichoke [*Helianthus tuberosus*], the author could not confirm the hypothesis of Boivin *et al.* [*R.A.M.*, 15, p. 206] that a glucidolipide endotoxin secreted by the pathogen is capable of inducing tumour formation.

Saperstein (S.), Starr (M. P.), & Filfus (Joyce A.). **Alterations in carotenoid synthesis accompanying mutation in Corynebacterium michiganense.**—*J. gen. Microbiol.*, 10, 1, pp. 85–92, 1 diag., 1954.

Colour mutants of the tomato pathogen, *Corynebacterium michiganense*, provided an opportunity to determine the nature of the pigments and the effect of mutation and nutrition thereon [*R.A.M.*, 28, p. 426] in the Department of Bacteriology, University of California, Davis. The major pigments of *C. michiganense* are carotenoids. The parent and mutant strains show distinct qualitative differences in pigment synthesis; the naturally occurring yellow parent type produces cryptoxanthin and lycopene, a pink mutant forms lycopene and spirilloxanthin, a red back-mutant produces only lycopene, and an orange mutant synthesizes cryptoxanthin, β-carotene, and canthaxanthin. Carotenoids were not detected in the colourless mutants.

Carotenoid synthesis in the yellow strain of *C. michiganense* is affected by thiamine in a manner similar to that previously described for *C. poinsettiae* [cf. 28, p. 381]: cryptoxanthin and lycopene are synthesized only at relatively high thiamine concentrations, whereas carotenoid formation in the orange strain does not appear to be influenced by external thiamine concentration, possibly because this culture synthesizes excess thiamine. No other nutritional factor examined caused detectable alterations in the colour of the cells.

Consideration of principles of fungicidal action in the control of Phytophthora pod rot of Cacao in Costa Rica.—*Cacao*, 2, 43–44, pp. 1–2, 1953.

Cacao pod rot (*Phytophthora palmivora*), prevalent in the Atlantic cacao growing regions of Costa Rica [see above, p. 713 and next abstract], was responsible for 38 per cent. losses of immature fruit and cherelles at the Cacao Experimental Farm, La Lola, in the January-June period, 1953. Protection of young fruits is therefore important and fungicidal control should be continued. The author emphasizes the need for work on the important features in the development of the disease, the nature of the resistance or susceptibility of the plant for the development of resistant varieties, and the factors determining the maximum efficiency of fungicidal materials and sanitary measures.

Cacao research program of the Inter-American Cacao Center.—*Cacao*, 2, 45–46, pp. 1–4, 1953.

The present research programme of the Inter-American Cacao Centre includes physiological and ecological studies of the cacao tree, selection of resistant clones, methods of plant propagation, cultural practices affecting diseases and their control, plant rehabilitation, and disease control.

For fungicide screening trials in the nursery for the control of pod rot (*Phytophthora palmivora*) [see preceding abstract], cacao seedlings four to five weeks old were sprayed first with the test fungicide and after this had dried with a sporangial suspension of the fungus. The number of diseased plants one and four weeks later

denoted the relative efficacy and residual capacity of the compound. Of the 30 fungicides used, Bordeaux mixture, tested as above, and perenox (2 lb. per 100 gals. water), tested in a seed-bed, were the most effective and adherent.

Of various spreaders and stickers tested in field trials, triton B-1956 and Spreader Sticker were relatively efficacious in maintaining the fungicide on the foliage. Research work on new, more effective stickers for the tropics is now in progress at the Interamerican Institute of Agricultural Sciences and is financed largely by the Standard Oil Development Company.

Swabely (Mary Ann) & Hart (Helen). **Infection of resistant varieties of Wheat by races of Puccinia graminis tritici.**—Abs. in *Phytopathology*, 43, 9, p. 485, 1953.

In inoculation tests [at Minnesota Agricultural Experiment Station] physiologic race 15B of *Puccinia graminis* [*R.A.M.*, 24, p. 142; 33, pp. 472, 663] produced few uredosori on the Kentana variety, the appressoria, which were often formed over the stomata, developing no further, though sometimes the host cells bordering the substomatal cavity were apparently damaged by diffusible substances from the appressoria. In contrast to the normally minute flecks and sparse mycelium of 15B, a Virginia biotype produces on Khapli emmer [*Triticum dicoccum*] blotchy flecks, a relatively abundant mycelium, and runner hyphae growing out towards the healthy cells. Again, profuse mycelium and some large uredosori are characteristic of another biotype of the same race from Oklahoma.

Race 11, highly pathogenic to Kentana at a temperature of 80° to 85° F., induces the 0 and 1 types of infection at 70°, with a restricted, compact mycelial mass, small, shrivelled haustoria, a few abnormally branching runner hyphae, and meagre sporulation.

Witsch (H. v.) & Kasperlik (H.). **Infektionshemmende Wirkung der Dichlorphenoxyessigsäure.** [Infection-inhibiting effect of dichlorophenoxyacetic acid.] —*Naturwissenschaften*, 40, 10, pp. 294–295, 1953.

Experiments are reported from the Botanical Institute, Weihenstephan, Bavaria, Germany, demonstrating the inhibitory action of 2,4-D on cereal rusts. At a concentration of 10γ per cent. added to Knop's solution in which seedlings were growing it reduced the number of pustules of *Puccinia graminis* per leaf on a highly susceptible wheat selection from 32 to 21 in one test and from 30·5 to 15 in another, on a moderately susceptible from 20 to 7, and on a slightly susceptible from 15 to 3. In one test at 25γ per cent. the number of pustules was reduced from 30·5 to 6·5 per cent., but at the same time the dry weight and length of the seedlings fell to about 77 per cent. of the values for the untreated. At lower concentrations there was little or no reduction of growth.

In another series of experiments seedlings were soaked in 2,4-D for 20 hours three to four days before inoculation and transference to Knop's solution. The average incidence of *P. graminis* and *P. hordei* in wheat and barley plants treated with a 0·01 per cent. solution was 5 to 10 and 10 to 15 per cent., respectively, of that developing in the controls, the corresponding figures for the 0·001 per cent. concentration being 10 to 20 and 25 to 35 per cent., respectively.

Briefly considering the available information on the subject [*R.A.M.*, 31, p. 179], the authors conclude that the inhibitory effect is achieved, at any rate in part, by imparting to the host cells a physiological capacity for resistance to the rusts.

Young (H. C.) & Wadsworth (D. F.). **Experimental forecast of Wheat leaf rust in Oklahoma.**—*Plant Dis. Reptr*, 38, 5, pp. 370–371, 1954. [Multilithed.]

Losses from wheat leaf rust (*Puccinia rubigo-vera tritici*) [*P. triticina*: *R.A.M.*,

33, p. 663] in Oklahoma are expected to average about 1 per cent. in 1954. The forecast is based on the weather conditions and amount of rust observed since April, 1953, and a survey of the wheat growing areas in March, 1954.

Sibilia (C.). **Le razze di Puccinia triticina in Italia ed in Europa.** [The races of *Puccinia triticina* in Italy and Europe.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 10 (*1952*), pp. 203–212, 1 map, 1953. [English summary.]

The author lists the physiologic races of *Puccinia triticina* [cf. *R.A.M.*, 19, p. 10; 26, p. 239; 33, p. 663] found on wheat in Italy [25, p. 551] up to the end of 1953, the distribution of each race in the country being indicated (and mapped), together with the date and author of each report, international race number, and whether the race was known previously. Most of the European records given are taken from the literature (28 titles) and have been noticed in this *Review* [17, p. 226; 29, p. 92; 31, p. 11; 32, p. 425]. The following additional ones are noted: Austria, races 6, 13 to 16 (inclusive), 20, and 42; Bulgaria [27, p. 376], 11 and 26; Czechoslovakia, 13 to 16; Finland, 5, 13, 15, 16, 21, and 42; France, 11, 13, and 15; Germany, 1, 5, 6, 7, 22, 24, 30, 42, 77, and 91; England, 10, 15, and 66 to 73 [24, p. 179]; Italy, 4, 25, 55 to 62, 84, 85, 86, 102, 129, 151, and 153; Holland, 11 and 13 to 16; Poland, 11, 13, 18, 20, 21, 23, and 24; Portugal, 74 and 75; Rumania, 13 to 17, 19, 20, 21, 24, and 54; Spain, 11, 24, 45, 57, 67, 86, 87, 105, and 131; Sweden, 11, 13, 14, 15, 20, 21, 22, 30, 42, and 91; Switzerland, 11; Hungary, 21 and 25; and U.S.S.R., 10, 13, 16, 19, 21, 24, 31, 53, 77, 91, 98, 99, and 115 to 121.

Of the 154 known races, 72 are present in Europe, the most widespread being 15, 20, and 11, each reported in 13 countries, and 13, 14, and 16 in 12, 11, and 10 countries, respectively.

In Italy the most prevalent races are 58 and 84, each found in four or five localities; races 15, 152, and 153 occur near Rome, and 15, 57, and 102 near Alessandria.

Pichler (F.). **Physiologisch-chemische Untersuchungen mit Weizensteinbrandsporen I. Katalasenaktivität.** [Physiologico-chemical studies on Wheat bunt spores. I. Catalase activity.]—*PflSchBer.*, 12, 5–6, pp. 73–87, 4 graphs, 1954. [English summary.]

At the Federal Plant Protection Institute, Vienna, catalase was detected in spores of wheat bunt (*Tilletia tritici*) [*T. caries*]. The primary object of the studies, to ascertain whether the fungicidal efficiency of seed-dressings [*R.A.M.*, 33, p. 530] could be deduced from their influence on the catalase activity of the spores, proved to be impracticable. There was no correlation, moreover, between germinability and catalase activity, which may be high in spores incapable of germinating. Activity can be enhanced by poisons, by heating the spores for an hour at 50° C., and by prolonged storage, where it reached a level 4·6 times higher than that of freshly collected material after 22 years.

Tyler (L. J.). **Survival of chlamydospores of Tilletia brevifaciens G. W. Fischer, exposed outdoors on soil.**—Abs. in *Phytopathology*, 43, 9, p. 487, 1953.

In July, 1947, heads of winter wheat infected by dwarf bunt (*Tilletia brevifaciens*) were collected in New York State [*R.A.M.*, 33, p. 145], and on 20th August were placed on soil out-of-doors in two dozen glass cloth bags covered by a $\frac{1}{4}$-in.-mesh screen. Germinability was tested by plating the spores (after 10 minutes' immersion in chlorox, 1 in 9, and washing) on 2 per cent. non-nutrient agar incubated at 6° C. Every sample tested was found to contain germinable spores, the highest proportion of which (10 to 30 per cent.) occurred in material exposed for six months to a year, diminishing gradually as the interval lengthened until in December, 1952, a bare

trace of germination was recorded in a sample exposed continuously on the soil for rather more than five years.

Shumilenko (E. P.). О предварительном протравливании семян зерновых культур гранозаном. [Preliminary treatment of grain culture seeds with granosan.]—Земледелие. [*Zemledelie, Moscow*], 2, 3, pp. 85–88, 2 graphs, 1954.

In field trials conducted in 1952 by the Biological Institute of the Ural affiliation of the U.S.S.R. Academy of Sciences, seed treatment of wheat (varieties Diamond and Lutescens 62), oats (Zolotoy dozhd [Golden rain]), and barley (Weiner and Record) in the autumn with granosan (1, 2, and 1·5 kg. per t[on] of seed, respectively) freed them all completely from, respectively, bunt [*Tilletia caries*: *R.A.M.*, 19, p. 391] and covered smuts [*Ustilago kolleri* and *U. hordei*: 18, p. 605], while those treated in the spring had 0·01 to 0·03 per cent. infection. Infection of spring-treated barley with *Helminthosporium* sp. was double that of the autumn-treated. Infection with loose smut [*Ustilago nuda*: 31, p. 113] was reduced by autumn treatment to 0·24 per cent. compared with 1 per cent. when seeds were sown immediately after treatment.

In 1953, seed treatment with granosan in March–April and November–December was tested at —26° [C.] on Diamond wheat and Odesky and Weiner barley. Barley infection with *Alternaria tenuis* [31, p. 596] from the treated seed was reduced. Wheat was completely free from bunt and loose smut [*U. tritici*: 33, p. 20] and barley from covered smut, though 2 per cent. loose smut occurred in barley plants from seed treated in April, 1953.

Slykhuis (J. T.). **The relation of Aceria tulipae Keifer to streak mosaic and other chlorotic symptoms in Wheat.**—Abs. in *Phytopathology*, 43, 9, pp. 484–485, 1953.

Aceria tulipae infesting diseased wheat [in South Dakota] transmitted wheat streak mosaic [*R.A.M.*, 33, p. 285] and induced other chlorotic symptoms and a leaf roll on young wheat plants. Cultures of mites developed from eggs transferred to healthy wheat caused leaf roll but no chlorosis until the mites became extremely numerous. However, after feeding on plants with either streak mosaic or two types of non-manually transmissible chlorosis, even small numbers of mites produced the respective symptoms on healthy wheat. There was no evidence that the virus was carried through the eggs. Live mites and eggs were found on winter wheat collected at various times through the winter and spring. Dispersal by wind of mites and hence of wheat streak mosaic virus has been demonstrated.

Gold (A. H.), Suneson (C. A.), Houston (B. R.), & Oswald (J. W.). **Electron microscopy and seed and pollen transmission of rod-shaped particles associated with the false stripe virus disease of Barley.**—*Phytopathology*, 44, 3, pp. 115–117, 1 fig., 1 graph, 1954.

Natural infection of barley by the false stripe virus [*R.A.M.*, 32, p. 674; 33, p. 665] is reported for the first time from California. Examined by electron microscopy at the Department of Plant Pathology, University of California, Berkeley, leaves, embryos, endosperm, pollen, and unfertilized pistils of inoculated plants of the Club Mariout variety were found to contain rod-shaped particles measuring approximately 130 by 30 mμ. Transmission of the virus by pollen was indicated by the presence of the rods in seed produced from healthy ovaries fertilized by pollen from diseased plants; such seed gave rise to about 10 per cent. diseased seedlings. Two out of four seeds of diseased Sonora wheat also contained the rods, but in lower concentration than in barley.

Pichler (F.). **Die wichtigsten Krankheiten der Gerste.** [The most important diseases of Barley.]—*Pflanzenarzt*, 7, 7, pp. 3–4, 1954.

Reports made to the Institute of Plant Protection show that in spring, 1954, in Ennstal, Austria, 84 per cent. of many winter barley varieties was destroyed by *Fusarium* snow mould [*Calonectria nivalis*]. Injury was also caused by *Typhula*. In recent years there have been sporadic outbreaks of a leaf-spot disease caused by *Marssonina graminicola* [*Rhynchosporium secalis*: *R.A.M.*, 31, p. 279], which is thought to have come in from abroad. It is transmitted by seed but seed disinfection confers no satisfactory protection. All kinds of barley are affected and after a heavy attack of the disease wheat or oats, which are immune, should be planted in the infected field. Seed from the diseased plants must not be used. Attacks by loose smut [*Ustilago nuda*] on winter barley are of economic importance; the author recommends warm water seed treatment.

Welsh (J. N.) & Johnson (T.). **Inheritance of reaction to race 7A and other races of Oat stem rust, Puccinia graminis avenae.**—*Canad. J. Bot.*, 32, 2, pp. 347–357, 1954.

Oat varieties such as Garry and Rodney with the Hajira type of resistance to all the known races of oat stem rust (*Puccinia graminis avenae*) were believed to have identical rust resistance until the discovery in 1952 of race 7A in a field of Rodney near Winnipeg [*R.A.M.*, 32, p. 667; 33, pp. 589, 660]. The new race was identical with race 7 except for its ability to attack Rodney and some sister strains, other sister strains as well as Garry being highly resistant. Studies of F_3 lines derived from crosses involving Hajira indicated that resistance to the various races tested was conditioned by three genes: A (present in Richland, Vanguard, Ajax, and Green Russian) governed resistance to races 1, 2, 3, 5, 7, 7A, and 12; B (in Canuck and Rodney) to the same except for 7A; and C to 4, 6, 8, 10, 11, and 13. Varieties such as Rodney, Canuck, and R.L.1225 presumably contain genes B and C, while those such as Garry and R.L.1574 contain all three.

Leach (W.), Bulman (Ruth), & Kroeker (Johanna). **Studies in plant mineral nutrition. I. An investigation into the cause of gray speck disease of Oats.**—*Canad. J. Bot.*, 32, 2, pp. 358–368, 1954.

In order to determine whether grey speck of oats is due directly to manganese deficiency [*R.A.M.*, 33, p. 103] or to microbial infection of roots rendered susceptible by the deficiency [15, p. 356], a series of experiments was conducted in the Department of Botany, University of Manitoba, Winnipeg, from 1949 to 1951, growing Tama oat plants in various nutrient solutions and under widely differing environmental conditions.

The results indicated that under otherwise favourable cultural conditions manganese deficiency alone will produce grey speck symptoms. Neither inoculation of the cultures with root material from grey speck plants nor variations in the pH of the culture solutions had any effect on incidence or symptom expression, but symptoms appeared later in cultures with a high calcium concentration than in those in which calcium was low.

McGinnis (R. C.). **Cytological studies of chromosomes of rust fungi II. The mitotic chromosomes of Puccinia coronata.**—*Canad. J. Bot.*, 32, 1, pp. 213–214, 1 pl., 1954.

In further studies at the Cereal Division, Department of Agriculture, Ottawa, germinating sporidia of *Puccinia coronata* f. sp. *secalis* [*R.A.M.*, 33, p. 669] were found to have a haploid number of three chromosomes, which appears to represent the basic number for the genus. It is postulated that *P. coronata* is a true diploid

while *P. graminis* [33, p. 341] is a tetraploid. Furthermore, *P. coronata* may be a constituent species of *P. graminis*; thus, they would have at least one genome in common.

Nattrass (R. M.). **Note on Puccinia polysora rust of Maize in Kenya.**—*E. Afr. agric. J.*, 19, 4, p. 260, 1 fig., 1954.

In Kenya a type of occurrence of *Puccinia polysora* [*R.A.M.*, 33, p. 420] on maize has recently appeared which takes the form of oblong spots parallel to the leaf axis and bounded on the long sides by the larger veins. The spots, which are infrequently rounded, are ½ to 1 cm. long and as wide as the interveinal area. They are separated longitudinally from one another by a distance of a few mm., but some occupying the same interveinal area overlap at the ends with an imbricate effect, though they are seldom truly confluent.

The term 'leopard spot' describes this type of symptom and differentiates it from the more usual over-all 'powdering' effect previously described [32, p. 620].

Wallace (G. B.) & Wallace (Maud M.). **Brown spot of Maize.**—*E. Afr. agric. J.*, 19, 2, pp. 84–85, 3 figs., 1953.

A brief account is given of the symptoms, geographical distribution, predisposing causes, and control of maize leaf spot (*Physoderma maydis*) [*R.A.M.*, 33, p. 533; C.M.I. map No. 106], found near Moshi, Tanganyika, in July, 1953.

Michaelson (Merle E.) & Christensen (J. J.). **Reduction in yield of Corn due to stalk rot.**—Abs. in *Phytopathology*, 43, 9, p. 479, 1953.

From 1950 to 1952, inclusive, two maize varieties were inoculated by the toothpick method [at Minnesota Agricultural Experiment Station] with *Diplodia zeae* and *Gibberella zeae* [*R.A.M.*, 32, p. 182] in the second internode above the ground, in the ear shank, in the internode below it, and in various combinations of the three sites. In general, yield reduction was heavier in Minhybrid 504 than in Minhybrid 607 and *D. zeae* was responsible for more damage than *G. zeae*, irrespective of the place of inoculation. The mean reduction for the three years was 9·7 per cent. for the former, and 6·8 for the latter pathogen, multiple inoculations per stalk raising these figures to 12·5 and 11·4 per cent., respectively. The average yield reductions, varieties and fungi combined, in 1950, 1951, and 1952 were 13·2, 7·4, and 10·5 per cent., respectively.

Jones (K. W.). **A note on damage to Dura (Sorghum vulgare Pers.) by hormone weedkillers.**—*E. Afr. agric. J.*, 19, 4, pp. 237–238, 4 figs., 1954.

Root killing of sorghum growing on the heavy clay soils of the Gezira, Anglo-Egyptian Sudan, caused by spraying the crop with hormone weedkillers for the control of the root parasite, *Striga hermonthica*, may be obviated by spraying not earlier than two weeks after sowing, using not more than 1 lb. of the product per acre, and applying the treatment when the soil is neither very dry nor very wet.

Rodigin (M. N.) & Gainullina (Mme R. G.). Влияние тепловой обработки семян на сортовую устойчивость Проса к пыльной головне. [The effect of heat treatment of seed on varietal resistance of Millet to loose smut.]—Земледелие [*Zemledelie, Moscow*], 2, 3, pp. 105–106, 1954.

In recent experiments in the U.S.S.R. heat treatment of millet [*Panicum miliaceum*] seed (hot air at 40° C. or hot water at 100° followed by cold water) increased both resistance to loose smut [*Sphacelotheca destruens*: C.M.I. map No. 219] and yields. In the varieties Dolinskoe 86 and Omskoe 38 infection was reduced by 46·8 and 27·9 per cent., respectively, by hot water treatment and in the former the yield was increased by 29·2 (hot air) and 42·4 (hot water) per cent.

Fedorinchik (N. S.). Особенности проявления и течения заболевания у Цитрусовых растений, пораженных **Deuterophoma tracheiphila Petri.** [The peculiarities of disease occurrence and symptom sequences in citrus plants infected by *Deuterophoma tracheiphila* Petri.]—Докл. Акад. сельскохоз Наук Ленина [*Rep. Lenin Acad. agric. Sci.* = *Proc. Lenin Acad. agric. Sci.*], 18, 6, pp. 23–26, 1953. [Received September, 1954.]

Investigations at the Pan-Soviet Scientific Research Institute of Plant Protection, U.S.S.R., revealed that in lemon trees *Deuterophoma tracheiphila* [*R.A.M.*, 33, p. 670] spreads along the conducting vessels and can penetrate to the heartwood, whereas in mandarins and other citrus species it spreads along the heartwood and then through other tissues to the conducting vessels, spread being most rapid upwards in the vessels. When infection occurs through the shoot tip, the leaves fall and the shoot dies in two to three weeks. The stem immediately below the first infected shoot usually becomes infected a month or two later. The fungus then spreads upwards and kills the shoot above more rapidly than the first.

Further control recommendations [cf. loc. cit.] include the pruning of infected shoots eight to ten days after the first leaf is shed. In trees under six years of age the branch carrying the infected shoots should also be removed.

Singh (R. S.) & Sinha (R. P.). **The fruit drop in Grape Fruit (Citrus paradisi) due to Colletotrichum gloeosporioides.**—*Sci. & Cult.*, 20, 1, pp. 41–43, 3 figs., 1954.

In recent years citrus anthracnose (*Colletotrichum gloeosporioides*) [*Glomerella cingulata*: *R.A.M.*, 12, p. 566, and above, p. 711] has been causing serious damage to grapefruit at Kanpur, Uttar Pradesh. Between July and January there are three distinct types of fruit drop, though the tissue of the stem-end is not injured nor is the taste of the juice of freshly dropped fruits deteriorated. The first type is characterized by a single, indefinite, reddish or reddish brown rind stain, resembling 'tea stain', on each dropped fruit in July and August. In September and October healthy-appearing fruits without any spot or stain and not over-ripe drop; this is typical of the second type. The 'anthracnose hard spot' appearance (third type) is very common in the winter, when fruits drop although the spot area is away from the stem-end. Both stained and unstained, freshly dropped fruits contain characteristic mycelium.

Inoculations with *G. cingulata*, isolated from the fruits, resulted in leaf spot, die-back of twigs, stem-end rot or spots (with and without injury of the fruit), and fruit staining and eventual fall (only wounded fruit). Pricking the rind with a needle dipped in spore suspension caused fruit rot. Spraying the fruit with careful deposition of the spray at the stem-end, using 4:4:50 Bordeaux mixture, 1 in 35 lime-sulphur, 0·1 per cent. copper sulphate solution, and 2 per cent. formalin, considerably reduced fruit drop in preliminary trials.

Srivastava (H. C.) & Singh (B.). **Seedling troubles in Citrus beds and their control.**—*Sci. & Cult.*, 20, 2, pp. 93–95, 1 fig., 1954.

Damping-off of grapefruit seedlings by *Pythium debaryanum* [cf. *R.A.M.*, 22, p. 305] and *Rhizoctonia* [*Corticium*] *solani* [26, p. 530] is reported to have been severe at the Botanical Garden, Kanpur, Uttar Pradesh, in 1951–2. Pre- and post-emergence damping-off were reduced from 44·6 and 32·2 per cent., respectively, in untreated inoculated soil, to 1·11 and 1 per cent., respectively, after soil treatment with formaldehyde dust (40 gm. per sq. ft.) and to 6·97 and 6·4 per cent., respectively, by mercuric chloride (1 per cent. soil drench). Seed germination was unaffected.

Aldrich (D. G.) & Buchanan (J. R.). **Soil phosphorus supply in healthy and phosphorus-deficient Citrus orchards in Southern California.**—*Proc. Amer. Soc. hort. Sci.*, 63, pp. 32–36, 1954.

An analysis of citrus orchard soils in southern California indicated that the trees

showed symptoms of phosphorus deficiency [*R.A.M.*, 32, p. 18] when the total phosphorus was below about 300 p.p.m., but not when it was above 600 p.p.m. An exception to these observations was furnished by those trees on rough lemon rootstocks which exhibited deficiency symptoms on soils with adequate phosphorus, and responded to the addition of phosphorus. It is concluded that both soil and leaf analyses are essential for diagnosing the need of citrus for phosphorus fertilization.

Samson (J. A.). **Schema voor de bemesting en bespuiting van Citrus.** [Schedule for the manuring and spraying of Citrus.]—*Surinaam. Landb.*, 2, pp. 17–20, 1954.

Instructions are given for the manuring and spraying of citrus trees in Surinam, the latter operation being indicated, for instance, in cases of combined rust-mite [*Phyllocoptruta oleivorus*] infestation and mineral deficiency, for which the following formula is recommended: 3 kg. sulphur spray, 2 kg. each of zinc and manganese sulphates, 1 kg. copper oxychloride or perenox or 4 kg. Bordeaux mixture, and 1½ kg. slaked lime. It should be applied once in three years shortly after flowering or in January to February. Zinc deficiency alone may be remedied by an annual treatment at the same period with 3 kg. sulphur, 2 kg. zinc sulphate, and 2 kg. lime.

[This paper also appears as *Meded. LandbProefst. Suriname* 14, 1954.]

Olson (E. O.). **Some bark and bud union disorders of Mandarin and Mandarin-hybrid rootstocks in Texas Citrus plantings.**—*Proc. Amer. Soc. hort. Sci.*, 63, pp. 131–136, 1954.

Twenty-five varieties of mandarin and hybrid mandarin rootstocks budded with grapefruit in Texas have been shown to be carrying cachexia (xyloporosis) virus [*R.A.M.*, 32, p. 18; 33, p. 535]. Reported susceptible for the first time are Choa Chou Tien Chieh, Dancy, Sanguinea, Satsuma, and Willowleaf mandarins, Altoona and four other tangelos, and Kusaie and Rangpur mandarin-limes. Tests showed that tristeza [33, p. 601] was absent from these experimental plantings. A disorder at the bud-union of Webb Red Blush grapefruit on calamondin (*Fortunella* sp. × *Citrus* ? *reticulata*) differed from xyloporosis in that it was localized in the bud-union. It was characterized by bark splitting, gumming of the inner phloem, xylem constriction, and internal bark projections fitting into depressions in the wood.

Wiles (A. B.). **Reaction of Cotton varieties to Verticillium wilt.**—Abs. in *Phytopathology*, 43, 9, p. 489, 1953.

The reactions of numerous varieties and selections of *Gossypium hirsutum* and several of *G. barbadense* and *G. arboreum* to *Verticillium albo-atrum*, a destructive pathogen of cotton in the lower Mississippi Valley and irrigated areas of the south-west [United States], were studied in the greenhouse by means of a seedling inoculation technique [*R.A.M.*, 32, p. 312]. *G. hirsutum* proved to be the most susceptible of the three species; the highest degree of resistance in this species was found in the varieties Smith 81–14, Auburn 56, Alabama Hybrid 257–202, and Hartsville, in the order listed. Progenies of individual plants of these varieties, grown to maturity and selfed, showed a more uniform type of resistance than the parents.

Krenner (J. A.). **Über die Stengelbruchkrankheit des Flachses.** [On the stem-breaking disease of Flax.]—*Agrártud. egy.*, 6, 1–2, 3 pp., 1954. [Hungarian: German summary supplied by author.]

During the excessively wet season of 1953 *Polyspora lini* [C.M.I. map No. 88] caused severe damage to linseed flax in Hungary, where the fungus was not recognized until recent years, probably owing to confusion with *Colletotrichum* [*linicola*: No. 159], which is, however, of no importance except on seedlings.

A detailed study of the life-cycle of *P. lini* showed that it produced two types of basidia. The author concludes that it should be transferred to the genus *Microstroma* of the Exobasidiaceae as *M. lini* (Laff.) n.comb.

Hawn (E. J.) & Vanterpool (T. C.). **Preliminary studies on the sexual stage of Rhizoctonia solani Kühn.**—*Canad. J. Bot.*, 31, 6, pp. 699–710, 1 pl., 43 figs., 1953.

This is a full account of studies at the University of Saskatchewan, Saskatoon, abstracts of which have already been noticed [*R.A.M.*, 32, p. 127 and next abstract] on the perfect state of *Rhizoctonia solani* from flax, which is considered to be closely related to *Corticium praticola* [cf. 33, pp. 383, 656]. The basidial state was obtained fairly consistently by culturing on rich media (malt or potato dextrose agar) for 30 days, transferring inoculum to 2 per cent. water agar, and keeping the plates for 14 to 21 days in diffuse light at 19° to 25° C. and a relative humidity of 70 to 80 per cent. Germination of the basidiospores occurred by repetition on water agar and by germ-tube formation on nutrient agar. The mature basidiospore was predominantly uninucleate, or occasionally binucleate.

Vanterpool (T. C.). **Corticium praticola and the Rhizoctonia solani problem.**—Abs. in *Phytopathology*, 43, 9, p. 488, 1953.

The basidial state of most of the *Rhizoctonia solani* or *Corticium praticola* [*R.A.M.*, 9, p. 345] isolates from blighted flax seedlings [in Saskatchewan, Canada: see preceding abstract] developed fairly readily in culture, whereas authentic strains of *C. solani* from potato could not be induced to sporulate. The results of further studies indicated that the flax strains correspond broadly to Houston's type A of *C. solani*, referable to *C. praticola*, and those from potato to his type C [24, p. 469]. Type A strains are also readily obtainable from lucerne and sugar beet and constitute the majority of the more pathogenic strains from cereal seedlings. The flax strains exhibit slight aversion from those of potato in mixed cultures, grow more rapidly, have a wider host range, are generally more pathogenic, and inhibit the growth of potato sprouts on water agar plates. It is argued that *C. praticola* is much more common than has been supposed and should include many forms hitherto designated *C. solani*.

Diseases.—*Rep. Indian Jute Comm., 1951–52*, pp. 81–89, 1953.

It is stated in this report [cf. *R.A.M.*, 32, p. 188] that the results of the date-sowing experiments to determine the period of leaf infection by *Macrophomina phaseoli* were similar to those of the previous year [loc. cit.]. Early sowing, however, does not prevent seedling blight and collar rot. Two very virulent strains of the fungus, causing epidemic collar and root rot, are present in medium and light soils of West Bengal, particularly where jute follows potato [cf. 33, p. 451].

Soft rot infection (*Sclerotium rolfsii*) [22, p. 97], confined to July and August, was similar in both *Corchorus capsularis* and *C. olitorius*. The presence of *M. phaseoli* and *Colletotrichum* sp. made it difficult to assess its importance as a primary or secondary pathogen. The sclerotia of *S. rolfsii* collected from infected plants in 1949 and stored in air-tight glass bottles survived until March, 1951, but failed to germinate after that date.

Keller (J. R.) & Potter (H. S.). **Thielaviopsis associated with root rot of some ornamental plants.**—*Plant Dis. Reptr*, 38, 5, pp. 354–355, 1 fig., 1954. [Multilithed.]

Thielaviopsis root rot (*T. basicola*) has been observed in Maryland affecting several greenhouse ornamental plants, including poinsettia [*Euphorbia pulcherrima*:

cf. *R.A.M.*, 32, p. 381], cyclamen [loc. cit.; 32, p. 483], begonia [29, p. 414], *Scindapsus aureus*, cineraria, and *Gerbera jamesonii*, and also elm seedlings obtained from Wisconsin.

Robinson (B. B.) & Johnson (F. L.). **Abaca, a cordage fiber.**—*Agric. Monogr. U.S. Dep. Agric.* 21, 130 pp., 28 figs., 1953. [Mimeographed. Received 1954.]

In this monograph on all aspects of abaca (*Musa textilis*) production [cf. *R.A.M.*, 30, p. 319] the section on diseases is divided into those occurring in the Philippines (pp. 33–39) and in Central America (pp. 41–47). The information on the three major diseases of abaca in the Philippines, abaca bunchy top [virus: 33, p. 675], *Fusarium oxysporum* var. [f.] *cubense* [30, p. 319], and abaca mosaic [? a strain of cucumber mosaic virus: 32, p. 482], has all been taken from the literature and has been noticed from time to time in this *Review*. Less important diseases in this area include dry sheath rot (*Marasmius semiustus*) [*M. stenophyllus*: cf. 33, p. 604], stem rot (*Helminthosporium torulosum*) [30, p. 319], and *Fusarium moniliforme* [*Gibberella fujikuroi*] var. *subglutinans* associated with heart rot [13, p. 240].

The heaviest losses in Central American abaca plantations (in Costa Rica, Panama, Honduras, and Guatemala) are due to 'tip-over' caused by a complex of insect pests and secondary fungal and bacterial root decay, a *Fusarium* being fairly constantly isolated. During 1949, from 25 to 60 per cent. of the stalks delivered to the mills were from immature plants which had fallen over at ground level, but losses were less in the two succeeding years. Leaf spot, caused by *Helminthosporium torulosum* and *Cordana musae* [33, p. 353; C.M.I. map No. 168], may also contribute to the losses.

F. oxysporum f. *cubense* has not been important so far on abaca in Central America, but in 1951–2 it was very prevalent at Guaymas, Honduras, on old plants.

Sheath rot is sometimes severe in the Bungulanon and Maguindanao varieties. A stalk rot due to *Micrococcus varians* has been observed in Honduras, Costa Rica, and Panama, and is believed to be associated with the banana borer (*Cosmopolites sordidus*) or poor cultural conditions.

In the section on the degenerative changes in the fibres (pp. 73–78) it is reported that the stripped fibre is subject to decomposition by species of *Aspergillus*, *Penicillium*, and *Chaetomium* [*R.A.M.*, 6, p. 296], but this may be avoided by storing properly cleaned fibre in warehouses, avoiding conditions of high moisture, high temperature, and poor air circulation.

Thomas (W. D.). **The longevity of Pseudomonas caryophylli.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 5, p. 23, 1953.

The results of toothpick inoculations of carnation plants with nutrient broth cultures of *Pseudomonas caryophylli* [*R.A.M.*, 33, p. 354] showed that in culture the pathogen loses its infectivity (though remaining weakly viable) after six months' exposure to sunlight. Kept dry in the dark, it lost infectivity rapidly after nine months but was still slightly pathogenic at the end of a year. Carnations wilted on planting in soil that had been contaminated for 10 months but not after a year, though it appears that infection may still be disseminated by tools even when the soil itself is free.

Tammen (J.). **Fusarium stem rot of Carnation.**—Abs. in *Phytopathology*, 43, 9, p. 485, 1953.

Cross-pathogenicity tests were applied [at the University of California, Berkeley] to 75 individual clones of *Fusarium 'roseum'* to determine whether those reported to attack carnation were biologically distinct from *F. r.* f. *cerealis* [25, p. 366]. The results showed that the carnation clones readily attack cereals and vice versa.

Hence it is concluded that the clones of *F. roseum* are not biologically specialized in respect of these hosts and that there is no apparent justification for the establishment of species forms.

THOMAS (W. D.) & DICKENS (L. E.). **A new bacterium causing leaf pimple of Carnation.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 5, p. 22, 1953.

Xanthomonas oryzae var. *dianthi* is the name proposed for the bacterium causing a leaf disease of carnations at the Colorado A and M College [*R.A.M.*, 33, p. 354]. It is a slow-growing, Gram-negative, motile rod, which does not reduce nitrates or proteins and grows best between 25° and 27° C. Entry is effected through unwounded roots or leaves.

BAXTER (L. W.) & PLAKIDAS (A. G.). **Dieback and canker of Camellias caused by Glomerella cingulata.**—*Phytopathology*, 44, 3, pp. 129–133, 1 fig., 1954.

This is an amplified version of the authors' study on the die-back and canker of camellia caused by *Glomerella cingulata* in Louisiana, a preliminary note on which has already appeared [*R.A.M.*, 33, p. 482]. In inoculation tests on 20 varieties of *Camellia japonica* a considerable degree of resistance was shown by Governor Mouton, Professor Sargent, and Ignescens; Prince Eugene Napoleon, Flora Plena, Nobilissima, T. K. Variegated, and two varieties of *C. sasanqua*, Rosea and Cleopatra, were highly susceptible; and the reactions of Rubra Virginalis and Gloire de Nantes were intermediate. There were wide differences in pathogenicity among the various isolates.

HAASIS (F. A.) & WINSTEAD (N. N.). **Distribution, dissemination and control of flower blight of Camellia.**—*Camellian*, 5, 3, pp. 6–7, 13, 16, 8 figs., 1954.

This popular, illustrated account of the life-history and symptoms of *Sclerotinia camelliae* [*R.A.M.*, 30, p. 161] on camellias includes notes on control, emphasis being placed on the importance of sanitation and the exclusion of infected material from disease-free areas. The formation of apothecia on fallen flowers may be suppressed by the application of cyanamid (calcium cyanamide) at 9·1 lb. per 1,000 sq. ft., ferbam at 6 lb., pentachloronitrobenzene at 4·5 lb., sulphur at 5·5 lb., or krenite-26 using 20 gals. of 1 per cent. solution.

DAVIS (S. H.). **Control of Phomopsis canker of Gardenia in the cutting-bench and on mature plants.**—Abs. in *Phytopathology*, 44, 2, pp. 109–110, 1954.

Gardenia cuttings dipped in a spore suspension of *Phomopsis gardeniae* [*R.A.M.*, 30, p. 107], dried, and immersed in solutions of PMAS (1, ½, or ¼ pt. per 100 gals.) for one minute prior to placing them in the cutting bench remained disease-free [at New Jersey Agricultural Experiment Station]. In a second series of tests, uninoculated cuttings inserted in sand mixed with fermate at rates of 2, 1, ½, or ¼ lb. per 100 lb. and infested by the pathogen also yielded healthy plants. A single spray of PMAS at 1 pt. per 100 gals., applied within two weeks after inoculation near soil-level with spore suspensions or mycelial mats, controlled the disease on three-year-old plants. A treatment with fermate (2 lb. per 100 gals.) immediately after wounding the base of similar plants prevented infection from spore suspensions for up to a fortnight. PMAS spray was phytotoxic to young tissues.

BUXTON (E. W.). **Heterocaryosis and variability in Fusarium oxysporum f. gladioli (Snyder & Hansen).**—*J. gen. Microbiol.*, 10, 1, pp. 71–84, 1 pl., 1 fig., 2 diags., 1954.

The basis of variation in morphological appearance of first cultures of *Fusarium oxysporum* f. *gladioli*, isolated from diseased roots and corms of prematurely

yellowed gladiolus plants [*R.A.M.*, 33, p. 230], was investigated at the Botany School, Cambridge. Each microconidium contains one nucleus derived by mitosis from the single nucleus of the conidiophore. Hyphal tips contain an average of seven nuclei, whilst the cells behind contain only one or two. Anastomoses between germ-tubes from conidia of different morphological variants occur very frequently and may provide a means whereby heterokaryons are formed.

Heterokaryotic cultures were synthesized by the simultaneous inoculation of plates containing water agar medium. Single hyphal tips from the resulting mixed colonies were grown and analysed by means of single spores from the resulting culture. Media varying in carbon content and in carbon/nitrogen ratio had a selective action on one or another of the homotypes constituting a heterokaryon of two known morphologically distinct variants. The use of such media revealed that the ratios of nuclei homotypic for 'flat sporodochial' and 'aerial microconidial' variants were altered according to the relative concentrations of carbon or nitrogen in the culture medium.

The bearing of these results on the reliability of hitherto important taxonomic criteria in a classification of these fungi is discussed.

Gagnotto (Anna-V.). **Osservazioni su Fusarium oxysporum Schl. var. gladioli Massey e prove di lotta contro di esso.** [Observations on *Fusarium oxysporum* Schl. var. *gladioli* Massey and experiments on its control.]—*Ann. Sper. agr.*, N.S., 7, 3, pp. 807–825, 2 graphs, 1953. [English summary.]

Studies conducted at the Plant Pathology Station, Rome, on the causal agent of corm rot of gladiolus (*Fusarium oxysporum* var. [f.] *gladioli*) [*R.A.M.*, 32, p. 562; cf. preceding abstract] and its control are described. Fifteen minutes' immersion in a 5 per cent. aqueous solution of H 11 B, an Italian product with an oxyquinoline base, satisfactorily controlled infection and exercised a strongly curative effect on diseased corms, promoting vigorous flowering. In general, pre-storage liquid treatments were not satisfactory, but H 11 B and N[ew] I[mproved] ceresan (0·2 per cent. aqueous solution) gave good results.

Kassanis (B.). **Tobacco necrosis viruses affecting Tulips.**—*Plant Path.*, 3, 1, pp. 26–29, 1954.

In attempts made at Rothamsted Experimental Station to transmit the lethal disease of forced tulips caused by tobacco necrosis viruses [*R.A.M.*, 28, p. 290; 29, p. 539; 31, p. 607] in 1948–9 and 1949–50 four methods of inoculation and the Rothamsted culture of the virus were used on four varieties; in 1949–50 the stipple streak strain was also used with one method and six varieties. The two strains of the virus behaved similarly and for the most part the only effective method was rubbing the virus over the leaves with celite. The most susceptible varieties were Korneforos, which developed the most extensive necrosis, and White Sail. In both seasons the inoculations failed to reproduce the symptoms of natural infection.

Groups of nine bulbs of Korneforos and White Sail planted in the open in 1950 were inoculated by (1) rubbing the scales with inoculum at planting, (2) watering the soil three times with a total of 1 l. of infective sap in 9 l. of water, and (3) rubbing the leaves in April; one group was left untreated. The only symptoms that appeared in 1951 were local necrotic spots. On forcing the daughter bulbs in January, 1952, only one plant (leaf-inoculated Korneforos) developed the disease with symptoms typical of naturally infected plants.

Since 1949 the author has observed 16 outbreaks of the disease in nurseries in eastern and south-eastern England. In eight the bulbs were newly imported from Holland. Korneforos was affected in seven of the outbreaks, and Alberio, Krelage's Triumph, Crater, and Zimmerman each in three. On three occasions field tulips in England have been affected. On one of these, when 10 per cent. Korneforos

and 5 per cent. Scarlet Wonder were affected, the stock had been grown on the farm for three years without trouble, and the disease appeared when the bulbs followed potatoes.

The evidence suggests that badly affected plants pick up the viruses during the year preceding that in which they display symptoms, the viruses persisting in the bulbs. Bulb tissues can act as symptomless carriers and the virus can always be recovered from symptomless main and axillary buds of bulbs with a necrotic main shoot. Though severely affected tulips generally fail to produce new bulbs, it is possible that slight infections may remain undetected, and the bulbs give rise to highly infective plants when forced the next year.

KARLING (J. S.). **The cytology of host reaction to infection by Synchytrium australe.**—*Amer. J. Bot.*, 41, 8, pp. 651–663, 66 figs., 1954.

The reaction of malvaceous hosts to infection by zoospores of *Synchytrium australe* [cf. *R.A.M.*, 25, p. 187], as evidenced by studies at Purdue University, Lafayette, Indiana, is manifested primarily by cell division and enlargement, when prosori develop, and by enlargement only in the case of resting spores. The composite, multicellular sporangial galls are usually derived from and involve only a single infected epidermal cell. The enlarged cell begins to divide a few days after infection, forming cells which grow round it to form the enveloping sheath. The asymmetry of the mature gall is due to more rapid growth of the first-formed cells, which cause the pore to assume a subapical position. The nucleus of the infected cell may also enlarge and may persist until the prosorus and sorus are mature. Infection of *Modiola caroliniana* is marked by an increase in cytoplasm and residue which turns reddish brown but there is very little residue in *Althaea rosea*. A fairly large number of galls abort on various hosts, the parasite apparently dying. Relatively resistant hosts, such as cotton (*Gossypium herbaceum*) and *Circaea latifolia*, may develop cushion- or dome-shaped protuberances.

HARDISON (J. R.). **New grass host records and life history observations of dwarf bunt in eastern Oregon.**—*Plant Dis. Reptr*, 38, 5, pp. 345–347, 2 figs., 1954. [Multilithed.]

Spore balls of dwarf bunt (*Tilletia brevifaciens*) were found in seed samples of *Agropyron trichophorum*, *Festuca arundinacea*, *F. rubra*, *F. ovina* var. *duriuscula*, and *Poa pratensis* from Union County, Oregon, indicating the spread of infection to additional grass hosts in the area in 1952 [cf. *R.A.M.*, 32, p. 257]. The maximum tolerance now specified for all seed classes of susceptible varieties at field inspection is 0·5 per cent. infection.

SIANG (W. N.). **Observations on Tilletia cerebrina.**—*Mycologia*, 46, 2, pp. 238–244, 2 figs., 1954.

The author describes the characteristics and nuclear cytology of spore germination in *Tilletia cerebrina*. The primary sporidia are multinucleate. This species parasitizes grasses in the genus *Deschampsia*, mainly in the western parts of the United States, Alaska, and eastern Canada (Southampton Island); it is also widely distributed in Europe.

LARGE (E. C.). **Surveys for choke (Epichloe typhina) in Cocksfoot seed crops, 1951–53.**—*Plant Path.*, 3, 1, pp. 6–11, 2 diags., 1954.

This contribution reports the continuation and conclusion of the work on the incidence and severity of choke (*Epichloe typhina*) in England and Wales [*R.A.M.*, 32, p. 384]. An extensive survey of 776 seed crops of Aberystwyth strains of cocksfoot [*Dactylis glomerata*] submitted for inspection in 1952, and 609 submitted

in 1953 indicated no appreciable difference in the incidence of the disease on the three strains of the grass (S.26, S.37, and S.143), or in the different Provinces, or in seasonal severity or incidence, the chief factor affecting incidence being the age of the stand. This was confirmed by the results of intensive surveys, with tiller counts, made by plant pathologists over the same period on 10 per cent. of the crops surveyed by the inspectors. In 1952 information was also collected on the seed yield from 50 crops of the 1951 intensive survey. Yields were extremely variable and influenced by many more important factors than the incidence of choke.

The mean total number of tillers (choked plus flowering) per foot run of drill was again found to be approximately constant whatever the amount of choke. There was no evidence of any compensatory effect tending to increase the number of flowering heads when some tillers were choked and none of any systemic effect tending to decrease the number. It may be assumed, therefore, that the percentage loss of seed is directly represented by the percentage of choked tillers, e.g. 10 per cent. choked represents 10 per cent. loss of seed. If this is so, the annual loss for all cocksfoot crops submitted for certification in England and Wales from 1951 to 1953, inclusive, was about 3 per cent., made up by an average loss of about 21 per cent. in a few fifth- to seventh-year crops, 9 per cent. in fourth-year, 7 per cent. in third-year, and 1·3 per cent. in second-year crops. Many of the older stands had become unproductive because of weeds and soil impoverishment. The ploughing-up of some of these has slightly reduced the over-all national loss. A mean loss of 7 per cent., however, in the important third-year crops fully justifies the continuance of research into the transmission and etiology of choke.

Langdon (R. F. N.). **Ergot of Paspalum dilatatum.**—*J. Aust. Inst. agric. Sci.*, 20, 1, pp. 52–53, 1954.

Climate is not a limiting factor in the development of ergot (*Claviceps paspali*) on *Paspalum dilatatum* in Australia [*R.A.M.*, 27, p. 24; cf. 33, p. 607], for every summer heavy and widespread infection is seen in coastal Queensland and New South Wales. In localized areas adverse weather conditions may prevent or greatly reduce infection, the effect being rather on the host than on the fungus. For example, in south-eastern Queensland in 1952 drought prevailed in late summer and *P. dilatatum* did not thrive. In the Nerang Valley very few inflorescences appeared before March, but after late summer rains heavy flowering occurred and widespread infection rapidly ensued. Sources of inoculum had become established on the fringe of the area near the coast, where infected *P. dilatatum* had been found in a moist locality in early February. The rapid spread of the disease to grass in flower was undoubtedly due to the efficiency of the insect vectors, particularly *Pyrellia coerulea*.

In August, 1949, a few *Paspalum dilatatum* plants growing in a moist, sheltered situation in Brisbane were found in head, heavily infected, and in the vicinity there were dead inflorescences with dried honey-dew on them, suggesting that the fungus may persist in the sphacelial state on a few inflorescences produced by the host during June and July. In milder climates overwintering in the sphacelial state might possibly be usual. It is concluded that *C. paspali* has now become permanently established in Australia, where heavy infections of *Paspalum* can be expected in normal wet seasons.

Drolsom (P. N.) & Dickson (J. G.). **Seedling and mature plant inoculation of Sudan Grass with Helminthosporium turcicum.**—*Phytopathology*, 44, 4, pp. 188–192, 1954.

In 1949–50 seedling plants of 321 lines and five varieties of Sudan grass, comprising the moderately resistant to resistant Tift and Piper, the moderately susceptible Sweet Sudan, the susceptible Commercial, and the very susceptible (Wis. sel.)

Line 109, were inoculated in the greenhouse at the University of Wisconsin with *Helminthosporium turcicum* [see next abstract]. Disease readings were taken on the leaf flecking and leaf blighting phases of the disease, of which the latter appeared to be the more important. Mature plant reactions in the field did not agree satisfactorily with the greenhouse classification of resistant and susceptible types.

The importance of environmental conditions in relation to the occurrence of field epiphytotics of leaf blight was well illustrated by plot experiments covering the period from 1950 to 1952. The relatively slow progress of the disease in 1950 was in marked contrast to its development in the other two seasons. In the first year heavy rains no doubt washed off the spores, while cool nights probably reduced the incidence of infection.

Inoculations in the greenhouse produced no blighting at 16° C. compared with severe symptoms at 20° to 22°. Natural epiphytotics of *H. turcicum* should be favoured, therefore, by periods with relatively warm nights and high humidity.

In the one year (1952) in which the method was used, diseased leaves spread about the nursery resulted in extensive infection and dissemination. Spreader plants, transferred from the greenhouse to the field, provided valuable sources of inoculum and were effective in the distribution of leaf blight throughout the season. Spray inoculation with conidia was the least dependable of the procedures tested.

Drolsom (P. N.). **Inheritance of leaf blight reaction in Sudan Grass.**—*Agron. J.*, 46, 7, pp. 329–332, 1954.

This is a tabulated survey of studies from 1950 to 1952, inclusive, at Wisconsin Agricultural Experiment Station, on the mode of inheritance of resistance to leaf blight (*Helminthosporium turcicum*) in Sudan grass (*Sorghum sudanense*) [cf. *R.A.M.*, 32, p. 132 and preceding abstract]. The crosses included moderately resistant lines × Piper, a susceptible line × Piper, and susceptible lines × Tift. The two varieties were resistant to the disease except in 1952, when their reactions ranged from resistant to moderately susceptible.

Several factors appear to be concerned in the response of Sudan grass to leaf blight. The F_1 generation was uniformly susceptible. Unimodal F_2 distributions provided evidence for the interaction of several genes of comparable importance. The apparent recovery of parental types in certain crosses (but not in others) suggested the involvement of a small number of genes. Of major importance are the changing environmental conditions from one season to the next and the probable existence of physiologic races of *H. turcicum* of differing pathogenicity [29, p. 361].

Shurtleff (M. C.). **Factors that influence Rhizoctonia solani to incite turf brown patch.**—Abs. in *Phytopathology*, 43, 9, p. 484, 1953.

In further tests [at Rhode Island Agricultural Experiment Station] isolates of *Rhizoctonia* [*Corticium*] *solani* capable of causing severe brown patch of turf grasses [*R.A.M.*, 33, p. 30] varied significantly in their capacity to induce crown necrosis, root rot, and damping-off. The mycelium survived for as long as four months in dry grass clippings. Sclerotia were viable after 25 successive germinations on water or potato dextrose agars. Certain isolates formed sclerotia on grass blades and crowns three days after leaf wilt. They germinated only at sustained humidities of or exceeding 98 per cent. and at temperatures of 15·6° to 37° C. While favourable weather conditions prevailed brown patch areas expanded about 1 in. daily despite the application of a phenyl mercury solution. At greenhouse temperatures of 19° and 27° the fungus advanced from 1 to 2 cm. daily through soil in flats containing Astoria colonial bent [*Agrostis tenuis*], infection originating on leaves in contact with the soil and progressing upwards.

Cullen (N. A.). **Molybdenum trials at Invermay.**—*N.Z. J. Agric.*, 88, 3, p. 241, 1 fig., 1954.

In molybdenum deficiency trials carried out in 1952–3 at Invermay, New Zealand [*R.A.M.*, 33, p. 608], on pasture that had received little, if any, top dressing since it was sown in 1945, plots were oversown with red and white clover, fertilized, and given different molybdenum treatments.

The optimum rate was found to be 1 to 2 oz. sodium molybdate applied with 3 cwt. superphosphate per acre and the best time of application September and November. By the end of the season over 100 per cent. increase in dry weight of herbage had resulted. Run-out, browntop-dominant hill pasture showed spectacular improvement. Liming slightly increased production on the molybdenum-treated plots.

Benedict (W. G.). **Studies on Sweet Clover failures in southwestern Ontario.**—*Canad. J. Bot.*, 32, 1, pp. 82–94, 2 pl., 1954.

Further studies on the failure of sweet clover (chiefly *Melilotus officinalis* but also *M. alba*) due to *Phytophthora cactorum* [*R.A.M.*, 31, p. 493] were extended to include the whole of south-western Ontario. The effects of the root rot causing failure are apparent in the spring of the second season following the resumption of growth of the tap root. The disease is either localized in the furrows and other depressions in the field or it thins or destroys the entire stand. When a healthy field plant becomes diseased following dormancy the first sign is drooping of the leaf petioles and wilting of one shoot or the whole plant. Below ground in the crown region, a water-soaked, discoloured lesion, turgid at first but later wrinkled and rotten, advances downwards. The lateral roots are either invaded by extension of the rot from the main root or attacked separately.

The fungus probably enters through the numerous lenticels on the tap root. Tissue invasion was intracellular in the relatively few first-season plants attacked and intercellular in second-year ones. Oospore production was stimulated on potato-dextrose agar by the addition of extracts of seedlings or immature roots, but not of second-year roots; a similar relationship to age of the host governed oospore production in infected plants. Mycelium was abundant in the cortical parenchyma considerably in advance of the lesions. Initial infection was rapidly succeeded by secondary organisms.

Epidemic outbreaks of failure were characterized by relatively short periods of high disease incidence in the early part of the second growing season in individual stands and appeared to depend on sustained high soil moisture coupled with high soil temperatures. However, no phenological condition could account for the outbreaks being confined to the beginning of the second season of growth, which seemed to be caused by a physiological change correlated with the developmental rhythm of the host.

Benedict (W. G.). **Stunt of Clovers, caused by Rhizoctonia solani.**—*Canad. J. Bot.*, 32, 1, pp. 215–220, 1 pl., 1954.

Stunting of clover was observed in several fields in the north-central part of Essex County, Ontario, in the early summer of 1952, apparently favoured by the hot, dry weather. Typical stunting was induced in potted red and alsike clovers, lucerne, and sweet clover [*Melilotus* spp.] grown in the greenhouse in soil from unthrifty fields. Of various fungi isolated from the roots and crowns a root-parasitizing strain of *Corticium solani* [*R.A.M.*, 30, p. 459] was found to produce typical symptoms in inoculation experiments. The isolates varied in pathogenicity, however, R–8 and R–17 causing pre-emergence damping-off of all four legumes tested, while other isolates allowed up to 76·7 per cent. emergence. The fungus

produced cankers at or below the soil surface, killing or severely injuring the affected parts. Mycelium occurred both within and outside the host tissues.

ERWIN (D. C.). **Relation of Stagonospora, Rhizoctonia, and associated fungi to crown rot of Alfalfa.**—*Phytopathology*, 44, 3, pp. 137–144, 2 figs., 1 graph, 1954.

Three lucerne diseases were investigated at the Department of Plant Pathology, University of California, Davis, namely, a dark crown necrosis, which could not be reproduced by using any of the commonly associated fungi, including *Fusarium 'roseum'*, *F. solani* [*R.A.M.*, 28, p. 629], and *Pythium* spp.; crown and root rot (*Stagonospora meliloti*) [18, p. 320], and stem and crown canker (*Rhizoctonia* [*Corticium*] *solani*) [32, p. 486 and preceding abstract].

The results of experiments in which inoculum of *S. meliloti* was placed over lucerne seeds demonstrated the possibility of seedling infection without wounding. Dipping roots and crowns in a spore or mycelial suspension for 30 minutes, followed by two days' incubation in a moist chamber before transplanting, induced 87 to 100 per cent. infection in the Africa variety, which was more susceptible than California Common. In small-scale trials Atlantic showed a high degree of resistance. Inoculum of *S. meliloti* did not survive for more than three months in sterilized or unsterilized soil at a level sufficient to cause infection.

The optimum temperature for the radial growth of *S. meliloti* on bacto-peptone agar and for the development of aerial mycelium and pycnidial formation on steam-sterilized lucerne stems was 18° C. The earliest germination of pycnidiospores (in 1¾ hours) occurred at 21° to 27°. They germinated eventually at 5° but not at 33° or 36°.

C. solani was present in the vessels of infected stems and induced a discoloration of the crown tissue above and below the cankers. Of 24 hyphal tip isolates tested, 12 were pathogenic both to crown stems and seedlings, one to the latter only, and 10 were non-pathogenic.

NELSON (R. R.). **Studies on Stemphylium leafspot of Alfalfa.**—*Diss. Abstr.*, 14, 6, p. 917, 1954.

Further studies on the biology of *Stemphylium* leaf spot of lucerne in Minnesota apparently caused by *Pseudoplea briosiana* [cf. *R.A.M.*, 33, p. 357] showed that the fungus overwinters chiefly as immature perithecia on plant debris and possibly in dormant plant tissues. It is perpetuated from July to the end of the growing season only by conidia. Leaflets, stems, petioles, peduncles, pods, and seeds are affected, but the greatest damage is from defoliation. In the greenhouse approximately 70 per cent. of the infected leaflets dropped in less than three weeks. Most defoliation occurs when the lesions are on the petioles or basal parts of the leaflets. The plants are most susceptible in the flowering stage. The disease results in smaller seed yields and poor quality seed. Optimum conditions for initial infection are temperatures of 18° to 24° C. and 100 per cent. relative humidity for at least 12 hours. A moderate temperature is the most important factor for subsequent disease development. Both cultural and parasitic races of the pathogen have been obtained and there is considerable genetic variation among isolates derived from the conidial and ascigerous states. Control appears to lie in selection for resistance, which should take into account the wide host range among forage crops [24, p. 42].

MULCOCK (A. P.). **A disease of Manuka Leptospermum scoparium Forst.**—*Trans. roy. Soc. N.Z.*, 82, 1, pp. 115–118, 1 pl., 1954.

Capnodium walteri [cf. *R.A.M.*, 15, p. 530] in combination with an insect, *Eriococcus manukae*, has been responsible for the death of manuka (*Leptospermum scoparium*), a noxious pasture weed, during the past decade in New Zealand. In the

final stages of the disease the plant appears fire-blackened. The disease was reproduced on manuka in the absence of insects by spraying the plants with a 1 per cent. honey solution at regular intervals following inoculation with a culture of *C. walteri*.

Shay (J. R.) & Williams (E. B.). **Physiologic specialization in Venturia inaequalis.** —Abs. in *Phytopathology*, 43, 9, pp. 483–484, 1953.

About 30 clones of 14 species of *Malus* have proved resistant to all strains of *Venturia inaequalis* tested from Illinois [*R.A.M.*, 33, p. 486], Indiana [loc. cit.], Australia, England [33, p. 34], Germany, Norway, and Yugoslavia [31, p. 333]. In 1951 spontaneous infections were observed in South Dakota on the previously resistant *Malus baccata* varieties Alexis and Dolgo, and in Nova Scotia on the Geneva variety of *M.* [*pumila* var.] *niedwetzkyana*, also hitherto resistant. In comparative inoculation tests in two seasons with material from these two localities (designated races 2 and 3, respectively) and the commonly occurring strains (race 1), race 2 differed from race 1 in its ability to attack Dolgo, Alexis, and Bitter Crab (*M. baccata*) and certain segregates of a Russian apple, R 12740–7A [33, p. 487], while race 3 was pathogenic to Geneva.

Atkinson (J. D.), Chamberlain (E. E.), & Hunter (J. A.). **Apple ring rot.**— *N.Z. J. Sci. Tech.*, Ser. A, 35, 6, pp. 478–482, 4 figs., 1954.

Apple ring spot is the name proposed for the disease of apples known as Henderson spot in the Auckland and Hastings districts of New Zealand [*R.A.M.*, 32, p. 133] and first observed near Nelson in 1935. The disease is most widespread on Granny Smith; a few fruits of Cox's Orange, Delicious, and Sturmer are sometimes affected. Light brown areas appear on young fruits in December, developing into patches of russeted tissue edged with a smooth dark brown band, and occasionally into concentric dark brown rings. Field evidence and grafting experiments indicated that the disease is perpetuated in infected scions and transmitted slowly to healthy grafted trees. Although there is no definite proof, the disease is thought to be of virus origin.

Smith (W. W.). **Occurrence of 'stem pitting' and necrosis in some body stocks for Apple trees.**—*Proc. Amer. Soc. hort. Sci.*, 63, pp. 101–113, 9 figs., 1954.

Apples of the varieties McIntosh, Cortland, and Spry, top-worked in 1940 on to body stocks of Virginia and Florence crab on domestic roots, which did not root satisfactorily from the body stock, exhibited, when 10 to 12 years old, wood pitting and other abnormalities similar to those caused by the citrus quick decline virus [cf. *R.A.M.*, 33, p. 535], and which may be due to virus infection rather than incompatibility of stock and scion.

Hildebrand (E. M.). **Relative stability of fire blight bacteria.**—*Phytopathology*, 44, 4, pp. 192–197, 1954.

Studies conducted from 1933 to 1937 on *Erwinia amylovora* at the Department of Plant Pathology, Cornell University, Ithaca, New York [*R.A.M.*, 18, p. 399 *et passim*], involved an investigation of the morphology, physiology, and pathogenicity to Green Kieffer pears [15, p. 374] of 136 isolates from collections made in the United States (40), New Zealand (15), and Canada (seven) on pear, apple, quince, *Crataegus* spp., *Raphiolepis umbellata*, *Pyracantha 'gibbsii'*, *Spiraea*, flowering almond, loquat, and medlar. The results of quarterly evaluations of the virulence of successive culture transfers demonstrated a high degree of variability, even in the stabilized environment of saprophytic culture. Of the 49 parents and 87 progenies, the daughter (single-cell) cultures were most consistent in the maintenance of high virulence. Of the 42 cultures which were strongly pathogenic in

1935, 17 had been highly, 23 moderately, and two slightly virulent in 1934, while of the 33 avirulent or attenuated in 1935, five had been highly, 18 moderately, and four slightly pathogenic, and six innocuous in 1934. The cell length of the highly virulent cultures was significantly less (1·42 μ) than that of the weakly pathogenic (1·61 μ) [16, p. 390]. More than 80 per cent. of the cells of avirulent cultures were without flagella, the numbers of which were always highest in strongly pathogenic isolates, reaching an average of 6·6, for instance, in the single-cell Ontario 36, as compared with only one in an attenuated parent culture, New Zealand 1. The length of the flagella also seemed to be related in some way to virulence, the proportion of cells with short flagella increasing directly with a decrease in pathogenicity.

There was virtually no correlation between virulence and the physiological behaviour of the cultures [24, p. 140], none of which produced indole or reduced nitrates or nitrites. However, all produced ammonia, besides fermenting litmus milk and liquefying gelatin.

A connexion seemed to exist between growth rates and virulence [17, p. 660], since loss of pathogenicity was associated with a reduction in generation time, e.g. from 77 to 72 minutes in a culture from Virginia.

Fischer (R.). **Kupfer- oder Schwefelmittel zur Bekämpfung der Kräuselkrankheit des Pfirsichs?** [Are copper or sulphur preparations preferable for controlling leaf curl of Peach?]—*Pflanzenarzt*, 7, 3, pp. 4–5, 1954.

In experiments carried out by the Austrian Federal Institute for Plant Protection in their orchards at Fuchsenbigl in Marchfeld, four groups of eight peach trees each were sprayed on 24th February and 6th March, 1953, with 0·5 per cent. wettable sulphur A (coarse grain), 0·5 per cent. wettable sulphur B (fine grain), 0·25 per cent. wettable sulphur A stirred into 1·5 per cent. copper lime solution, and 2·5 per cent. copper lime solution, respectively. Symptoms of leaf curl [*Taphrina deformans*: *R.A.M.*, 13, p. 317; cf. 33, p. 677] appeared on unsprayed trees on 18th May. By 2nd June only the trees sprayed with 2·5 per cent. copper lime solution were unaffected. This solution is recommended for application at bud swell, or alternatively finished copper products at a concentration twice that used in summer. In heavily affected areas copper lime should be applied towards the end of November or later and followed in early spring with 15 per cent. standard lime sulphur.

Horn (N. L.) & Hawthorne (P. L.). **A new fruit rot of Peach.**—*Phytopathology*, 44, 3, pp. 134–136, 1 fig., 1954.

The hitherto undescribed fungus parasitizing peaches in Louisiana [*R.A.M.*, 32, p. 260] is designated *Diplodina persicae* n.sp. [without a Latin diagnosis]. The symptoms it induces on the fruits have already been described [loc. cit.]. Inoculation of young leaves under conditions of high humidity in the greenhouse resulted in the development of mostly irregular, sometimes oval to circular spots up to 15 mm. in diameter, frequently composed of alternating brown to black, concentric rings. Naturally infected foliage presented a similar appearance. Twigs reacted to inoculation by the formation of chocolate-coloured, later dark brown, sunken areas. Southland and Burbank Early Elberta were the most susceptible of the varieties tested and Sunhigh the least.

D. persicae is characterized by dark, glabrous, spherical, erumpent, discrete pycnidia, 130 to 210 (average 175) μ in diameter; simple conidiophores measuring up to 25 by 2·5 μ; and bi- or occasionally tricellular, hyaline conidia (cream-buff in the mass), 22 to 30 by 5·5 to 7 (26·5 by 6·5) μ. Lima bean and potato dextrose agars were the best of the media tested for sporulation and mycelial development and the optimum temperature was 27° C. The addition to the medium of 0·25

per cent. lactic acid at the rate of 1, 2, and 3 drops per 5 ml. reduced the growth of the fungus to half, one-eighth, and a trace, respectively.

In Laboratory tests captan, ferbam, and an experimental fungicide crag 5400 were effective in the prevention of fruit rot by *D. persicae*.

Gigante (R.). **Ricerche preliminari sul mal del piombo non parassitario del Pesco in Provincia di Ravenna durante gli anni 1949 e 1950.** [Preliminary researches on non-parasitic silver leaf disease of Peach in the Province of Ravenna during the years 1948 and 1950.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 10 (*1952*), pp. 3–16, 5 figs., 1953. [French and English summaries.]

In May, 1949, peach trees growing in many widely different localities in the provinces of Ravenna and Forlì, Italy, were affected by a silver leaf disease, but only a few were attacked by *Stereum purpureum* [*R.A.M.*, 32, p. 570], the remainder having a non-parasitic disorder [13, p. 385; cf. 33, p. 658]. The latter form was present under widely different environmental, climatic, and cultural conditions, and appeared to be unaffected by soil type or different fertilizer applications. In Ravenna the symptoms, often severe in spring, sometimes disappeared completely in summer, reappearing again during the first fortnight of September. In April, 1950, the disease recurred and in June the leaves and internodes of the current year's twigs on some affected trees were shortened; trees which had been very severely diseased in 1949 or before bore rosette formations, the dwarfed leaves bearing protuberances and undulations.

In both years injuries due to cold were consistently detected in the wood and cortex of affected material obtained from various localities where for some time temperatures at the end of winter had been unusually high, falling sharply early in spring. It is concluded that such injury, while not the cause of the condition, may possibly be a predisposing factor. Further investigations are to be made to determine whether the disease is of virus origin.

Brook (P. J.). **Experiments in control of Peach brown-rot (Sclerotinia fructicola (Wint.) Rehm.).**—*N.Z. J. Sci. Tech.*, Sect. A, 35, 5, pp. 437–450, 1954.

In spraying experiments at Auckland, Hastings, and Gisborne, New Zealand, from 1947 to 1953 on the control of brown rot (*Sclerotinia fructicola*) on Golden Queen and Paragon peaches [*R.A.M.*, 33, p. 140], applications of phygon XL or thirospray (50 per cent. thiram), both at 1 lb. per 100 gals., at three- or four-day intervals during flowering, reduced blossom blight from 15 (unsprayed) to between 2·1 and 3·5 per cent., and when continued until within a few days of picking reduced fruit infection at harvest from 18·5 to 2·5 per cent. and after ten days' storage from 4·4 to between 0 and 2·3 per cent. Flit 406 (50 per cent. captan at 1 lb.) was best for fruit rot control (3·7 per cent. infection as against 22·1 per cent. for the unsprayed) because it did not affect the appearance or flavour of the peaches.

Thornberry (H. H.) & Ray (B. R.). **Wilt-inducing protein-like pigment from Armillaria mellea (Vahl) Quél. isolated from Peach roots.**—Abs. in *Phytopathology*, 43, 9, p. 486, 1953.

A dark brown, protein-like pigment was obtained from a liquid shake culture of *Armillaria mellea* isolated [at Illinois Agricultural Experiment Station, Urbana] from a root of a wilted peach tree. It was separated from the medium by adsorption to and elution from celite and partially purified by differential sedimentation in an ultracentrifuge. Aggregation into microscopically visible particles occurred round pH 6·5, and at 4 the aggregates were large enough to precipitate. The substance induced wilting in tomato seedlings and peach twigs at a concentration of 0·016 mg. per ml., penetrating 15 to 20 mm. into the vascular tissues. It would appear,

therefore, that the pigment aggregates at the pH of the plant sap (5·6) and mechanically occludes the water-conducting tissues.

Chilton (J. E.). **Peach wart virus in New Mexico.**—*Plant Dis. Reptr*, 38, 5, p. 329, 1954. [Multilithed.]

In 1952 severe infection by peach wart virus [*R.A.M.*, 32, p. 615] was observed on several Candoka trees near Farmington, New Mexico. The disease, believed to have been introduced into the area on these trees as nursery stock, has for the past 15 years been confined to them without affecting adjacent trees of known susceptible varieties, indicating that no vector of the virus is present in the area.

Vučenović (A.), Petrović (N.), Minić (M.). **Zapažanja o nekim virozama voćaka u našim rasadnicima.** [Observations on some viroses of fruit trees in our nurseries.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 21, pp. 42–47, 1954. [English summary.]

A survey of the virus diseases of fruit trees in Yugoslavia, carried out in 1952, indicates the danger of plum pox disease [*R.A.M.*, 33, p. 305] and to a lesser extent of fig mosaic virus [32, p. 574]. Two [unidentified] virus diseases, one characterized by greenish yellow spots and streaks and marginal necrosis on apricot leaves and the other by yellow spots and vein necrosis on apple leaves, are described briefly.

McGlasson (W. B.). **The effect of ultra-violet irradiation on the development of brown rot in stone fruits after harvest.**—*J. Aust. Inst. agric. Sci.*, 20, 1, p. 48, 1954.

In an experiment carried out at the Horticultural Branch, Department of Agriculture, Adelaide, South Australia, ten samples, each of 50 apricots picked at a firm, ripe stage from two trees, were inoculated by spraying with a spore suspension of *Sclerotinia fructicola* [*R.A.M.*, 31, p. 612] from field-infected cherries. They were exposed to ultra-violet light for periods of 1, 15, 30, and 60 minutes and then incubated at 65° F. for five days at high humidity. Significant reductions of infection resulted from 15 minutes' irradiation of the fruits from one tree (16 infected fruits per random sample of 50, as against 35 for unirradiated) and from 30 minutes' irradiation of fruits from the other tree (11 and 25, respectively). Slight damage occurred to fruit subjected to 30 minutes' exposure and noticeable darkening on one side of fruit irradiated for 60 minutes.

Chamberlain (E. E.), Atkinson (J. D.), & Hunter (J. A.). **Moorpark-mottle : a virus disease of Apricots in New Zealand.**—*N.Z. J. Sci. Tech.*, Sect. A, 35, 6, pp. 471–477, 6 figs., 1954.

An unusual leaf mottle, believed to be caused by a virus, was observed for the first time in 1950 on five of the 89 Moorpark apricot trees in an orchard in Central Otago, New Zealand. Foliage symptoms become conspicuous in late December and early January throughout the tree, except on small, immature leaves. Variable chlorotic areas are scattered over the leaf surface, or grouped round the margins or towards the tips, or form irregular patterns, usually most conspicuous on the upper surface. The fruits become affected about mid-January; they are stunted and misshapen, with depressions on each side near the stem cavity, mature a week later than normal, and are tough and leathery. The growth of the trees is unaffected.

The disease was transmitted by budding to apricot, to seedling and Paragon peach, which developed severe shock symptoms of chlorosis, reddening, and marginal necrosis the year following budding, and to cherry plum, which reacted by comparatively mild leaf chlorosis.

Since Moorpark-mottle virus is regarded as potentially dangerous, eradication is recommended and the five originally infected trees have already been destroyed.

Hungerford (C. W.) & Nichols (C. W.). **Distribution in Idaho of the disease on Peach and Cherry caused by the western X virus.**—*Circ. Idaho agric. Exp. Sta.* 119, 11 pp., 1952.

Most of this information on the western X disease virus [strain of peach X-virus: see following abstracts] in peach and cherry orchards in Idaho [*R.A.M.*, 28, p. 69] has already been noticed from another source [31, p. 22]. Careful selection of virus-free propagation wood gives protection against the introduction of new sources of infection.

Nielson (M. W.) & Jones (L. S.). **Insect transmission of western-X-little-Cherry virus.**—*Phytopathology*, 44, 4, pp. 218–219, 1 fig., 1954.

In a plot isolated from commercial cherry orchards at The Dalles, Oregon, in May, 1951, several hundred leafhoppers (*Colladonus geminatus*), collected on lucerne, were placed in sleeve cages on peach, sour cherry, and sweet cherry trees, all infected by western X-disease virus [strain of peach X-virus: *R.A.M.*, 33, p. 488 and preceding and next abstracts], and the two cherries by little cherry [see above, p. 708], presumed to be the same virus. After feeding for 37 to 46 days half the insects of each group were caged on healthy Montmorency sour cherry (49 tests) and the other half on J. H. Hale peach trees (20 tests) for 116 to 126 days, the test plants alternating with adjacent untreated ones which served as controls.

By about a year later, seven of the sour cherry trees infested with leafhoppers from cherry had developed the typical symptoms of peach X-little cherry, and also one peach infested with the same lot of leafhoppers, but there was no evidence of transmission from peach to cherry. Immediately on recognition in the early summer of 1952, each symptom-bearing cherry was indexed on peach by bud inoculation, and by the following spring at least two of the inoculated trees had developed peach X-virus symptoms.

Thornberry (H. H.). **Preliminary report on insect transmission of Eastern Peach X-disease virus in Illinois.**—*Plant Dis. Reptr*, 38, 6, pp. 412–413, 1 map, 1954. [Multilithed.]

From preliminary studies at the University of Illinois, Urbana, the author suspects that eastern peach X-disease virus [strain of peach X-virus: see preceding abstract] may be transmitted by *Colladonus clitellarius*, which occurs in various localities in the State. Transmission of the disease from infected chokecherry [*Prunus virginiana*] to peach was effected by a mass collection of insects, including *C. clitellarius*, from an area where the chokecherry carried the disease. Individuals of *C. clitellarius* confined to diseased peach foliage died soon afterwards; this might explain the non-transmission of the virus from peach in nature when it can be carried from chokecherry to chokecherry and peach; the vector probably survives on peach long enough to transmit the virus but not to acquire it and then migrate to a healthy plant.

Willison (R. S.). **Some observations on virus diseases of the cherry.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 320–325, 1953. [French summary.]

This is a general review of the response of cherry trees to virus infections [*R.A.M.*, 33, p. 611] and of methods of identifying and resolving the complexes on other *Prunus* species.

Gilmer (R. M.), Moore (J. D.), & Keitt (G. W.). **X-disease virus : I. Host range and pathogenesis in chokecherry.**—*Phytopathology*, 44, 4, pp. 180–185, 4 figs., 1954.

On the basis of the symptomatological studies herein fully reported from New York (Geneva) and Wisconsin Agricultural Experiment Stations, three strains of

peach X-virus [see preceding abstracts] were differentiated on *Prunus virginiana* [*R.A.M.*, 30, p. 618], (1) anthocyanotic, (2) chlorotic, and (3) non-rosetted, of which the first two only were readily transmissible by inoculation. The virus was found in both aerial and subterranean parts of diseased trees in the growing season but in the former alone during dormancy [cf. 30, p. 421]. Transmission from dormant buds of infected trees was easily effected after 35 days' storage at 34° to 36° F.

Combinations of peach X-virus with [cherry] necrotic ring spot [33, p. 678], prune [plum] dwarf [loc. cit.], sour cherry yellows, or green ring mottle viruses yielded no evidence of cross-protection or alteration of X-disease symptom expression. Wild chokecherries harbouring both peach X-virus and necrotic ring spot were frequently observed in the field.

Peach X-virus was transmitted to 15 species not hitherto recorded as hosts [30, p. 421], including the following: *P.* [*serrulata* var.] *lannesiana*, *P. mahaleb*, *P. newporti*, the Abundance and Burbank varieties of *P. salicina*, the Kwanzan and Takasago varieties of *P. serrulata* and *P. sieboldi*, respectively, and *P. spinosa*.

Dye (D. W.). **Blast of stone-fruit in New Zealand.**—*N.Z. J. Sci. Tech.*, Sect. A, 35, 5, pp. 451–461, 5 figs., 1954.

This is an amplified account of stone fruit blast (*Pseudomonas syringae*) [*R.A.M.*, 33, p. 5] in New Zealand, a brief description of which has already been noticed from another source [loc. cit.]. The disease attacks apricot, cherry, almond, plum, peach, and nectarine. The morphology and cultural and physiological reactions of the bacterium are described.

Dement'eva (Mme M. I.). О групповой устойчивости Крыжовника к заболеваниям. [Concerning the group resistance of Gooseberry to diseases.]—Докл. Акад. сельскохоз. Наук Ленина [*Rep. Lenin Acad. agric. Sci.* = *Proc. Lenin Acad. agric. Sci.*], 18, 6, pp. 32–34, 2 figs., 1953. [Received September, 1954.]

Investigations at the Moscow Timiryazev Agricultural Academy, U.S.S.R., indicate that the gooseberry varieties Michurinsky Chernuy Negus [Michurin Black Negus], Hauton, Karry, Pyatiletka [Five Year Plan], Muisovsky 17, and Muisovsky 37 are resistant to a group of the most harmful gooseberry diseases, namely, American mildew (*Sphaerotheca mors-uvae*) [*R.A.M.*, 33, p. 162], grey mould (*Botrytis cinerea*), anthracnose (*Gloeosporium ribis*) [*Pseudopeziza ribis*], cluster cup rust (*Puccinia ribesii-caricis*) [*P. pringsheimiana*], and two non-infectious diseases (shoot wilt and leaf chlorosis).

Folsom (D.). **Bacterial fire blight of Raspberry associated with Raspberry cane maggot.**—*Plant Dis. Reptr*, 38, 5, pp. 338–339, 2 figs., 1954. [Multilithed.]

Evidence is presented of the association of raspberry fire blight (*Erwinia amylovora* f.sp. *rubi* n.f.sp.) in central Maine [*R.A.M.*, 31, p. 130] with the raspberry cane maggot (*Pegomyia rubivora*), instances being observed of the spread of infection from terminal shoots injured by maggots into other parts of the cane or to adjacent side shoots. In a plantation at Carmel weekly roguing of maggot-infested shoots in 1951 eliminated blight by the following year.

Cadman (C. H.). **Studies in Rubus virus diseases. VI. Aphid transmission of Raspberry leaf mottle virus.**—*Ann. appl. Biol.*, 41, 1, pp. 207–214, 1954.

Continuing his studies on *Rubus* virus diseases at the Scottish Horticultural Research Institute, Dundee [*R.A.M.*, 32, p. 682], the author demonstrated that raspberry leaf mottle virus [31, p. 439] is acquired by *Amphorophora rubi* in feeding periods of half an hour to two hours. During continuous feeding on healthy plants

infectivity falls rapidly after two hours, but it persists for at least five hours if aphids are transferred at frequent intervals to healthy plants. The estimated probability of infection by single aphids is 1 in 20. Only occasionally did more than 50 per cent. of the test plants (*Rubus occidentalis*) become infected; this is attributed mainly to variation in plant susceptibility. Young leaves of infected Norfolk Giant were better sources of virus than older leaves, which may imply variation in virus concentration between leaves of different ages. It is concluded that the results obtained are simply explained if aphids acquire increasing amounts of virus with increasing infection periods and lose it rapidly. The main factor limiting transmission by *A. rubi* is host plant resistance.

Quantz (L.). **Viruskrankheiten der Himbeeren und Erdbeeren.** [Virus diseases of Raspberries and Strawberries.]—*Z. PflKrankh.*, 60, 12, pp. 599–609, 3 figs., 1953. [English summary.]

This review of 18 contributions to the literature from countries outside Germany on raspberry and strawberry viroses [cf. *R.A.M.*, 33, p. 679 and next abstract] comprises information on symptomatology, etiology, host range, transmissibility, and aphid vectors, concluding with some references to control by roguing, aphid extermination, use of resistant varieties, production of virus-free stocks, and introduction of a certification scheme.

Darrow (G. M.), Goheen (A. C.), & Miller (P. W.). **The importance of virus diseases in the cultivation of Strawberries in the United States.**—*Proc. Amer. Soc. hort. Sci.*, 63, pp. 547–552, 1954.

This review is an extension of a previous survey [*R.A.M.*, 31, p. 288] of the status of strawberry virus diseases in the United States, and outlines the importance of these diseases in commercial strawberry production, and the measures being taken to combat them.

Wilkinson (E. H.). **Observations on grey mould in Strawberries.**—*Plant Path.*, 3, 1, p. 12, 1954.

In June, 1953, Royal Sovereign and Auchincruive Climax strawberries at Wye College farm, Kent, developed severe infection by *Botrytis cinerea* [*R.A.M.*, 17, p. 689; 33, p. 541, *et passim*]. By 18th June the estimated loss of crop was at least 40 and 10 per cent. for the two varieties, respectively. On 20th and 22nd June all diseased berries were removed from the whole acre of Royal Sovereign and the two acres of Climax. Further infection developed and affected fruits were again collected. The cost of removing the diseased fruit while picking was in progress was about £50 per acre. The Royal Sovereign finally yielded $2\frac{1}{4}$ tons of sound fruit, with a market value of about £365. For Climax yield of sound fruit was over $3\frac{1}{4}$ tons per acre.

Bolton (A. T.). **Gnomonia fructicola on Strawberry.**—*Canad. J. Bot.*, 32, 1, pp. 172–181, 2 pl., 3 graphs, 1954.

Gnomonia fructicola was found to be capable of causing serious damage to strawberries in Ontario and Quebec [*R.A.M.*, 31, p. 443] under favourable environmental conditions; sometimes losses attained 25 per cent. Following inoculation in the greenhouse, the first leaf symptoms were numerous dark pin-point lesions along the main veins on the lower surface of the blades and on the petiole. As a result of the girdling of the petioles the leaves turned red or yellow and finally became completely necrotic; the entire petioles became dark and soft. On the blades the lesions enlarged and coalesced, becoming necrotic and causing blotching of the upper surface; spread proceeded slowly, however, and only about 15 per cent.

of the leaves developed blotching before being killed by girdling of the petiole. The fruits and peduncles developed brown lesions nine days after inoculation. If the fruits were large and green when infected they began to ripen prematurely and were eventually rotted by *Botrytis cinerea*. In artificially infected blades *G. fructicola* entered by the stomata and tended to follow the vascular elements along which the pycnidia and perithecia were usually formed. Under experimental conditions the disease damaged the crop as severely as leaf blight (*Dendrophoma obscurans*) [33, p. 468], leaf scorch (*Diplocarpon earliana*) [loc. cit.], and leaf spot (*Mycosphaerella fragariae*) [33, p. 163]. Growth and reproduction of *G. fructicola* on modified Czapek's medium were favoured by high concentrations of starch, cellulose, and pectin, but suppressed by dextrose.

Pelletier (E. N.) & Hilborn (M[erle] T.). **Blossom and twig blight of low-bush Blueberry.**—Abs. in *Phytopathology*, 43, 9, p. 481, 1953.

Botrytis cinerea infects the developing buds, stems, and flowers of low-bush blueberry [*Vaccinium angustifolium*: cf. *R.A.M.*, 27, p. 30] under conditions of high humidity persisting for at least 72 hours. Of 41 fungicides tested for its control [at Maine Agricultural Experiment Station, Orono], vancide 51, manzate, ferbam, ziram, and captan were completely effective in the greenhouse. In the field ferbam, ziram, and manzate gave 100, 69, and 33 per cent. control, respectively, while phygon, only moderately efficient in the greenhouse, was also entirely satisfactory. Of the 12 antibiotics tested, rimocidin, thiolutin, and streptomycin sulphate exerted a strong inhibitory action on the fungus in slide germination assays but were ineffectual against the disease in the greenhouse.

Bailey (J. S.) & Drake (M.). **Correcting magnesium deficiency in cultivated Blueberries and its effect on leaf potassium, calcium, and nitrogen.**—*Proc. Amer. Soc. hort. Sci.*, 63, pp. 95–99, 1954.

During an experiment at Middleboro, Massachusetts, in 1949 on the effects of the application of Epsom salts and dolomite limestone to magnesium-deficient cultivated blueberries [*Vaccinium* spp.], the differences in concentration of magnesium in the leaves of treated and untreated plants were significant. Leaf potassium, calcium, and nitrogen were not affected by the addition of magnesium. Symptoms of deficiency were almost eliminated by the application of 25 lb. per acre magnesium oxide as Epsom salts or 200 lb. as dolomitic limestone.

Zentmyer (G. A.). **Resistance to Phytophthora root rot of Avocado.**—Abs. in *Phytopathology*, 43, 9, p. 490, 1953.

In connexion with the development of resistance to avocado root rot (*Phytophthora cinnamomi*) in wet, poorly drained soils in California [*R.A.M.*, 33, p. 99] collections were made in 1952 of six species of *Persea* growing in similar locations in Central America and Mexico, which might serve as rootstocks. The results of tests in contaminated soil demonstrated a measure of resistance in *P. skutchii*; the other species, as well as some resistant clones from avocado varieties in southern California, are being propagated for trials. Seedlings of *P. borbonia* from swampy areas in the south-eastern United States are immune from or highly resistant to the pathogen but the species is apparently incompatible with avocado. In wet sites in Mexico the fungus was found on avocado and *P. schiedeana*.

Volcani (Zafrira). **Bacterial soft rot of Avocado fruit.**—*Nature, Lond.*, 174, 4430, pp. 604–605, 1954.

In December, 1953, a soft rot caused by a non-gas-forming strain of *Erwinia carotovora* was found in Israel on several avocado fruits from a single tree of the Californian variety H. L. Pathogenicity was proved by inoculation.

Graniti (A.). **'La lebbra' delle Olive in Sicilia.** ['Leprosy' of Olives in Sicily.]—*Notiz. Malatt. Piante, 1953*, 27(N.S. 6), pp. 27–32, 2 figs., 1954. [English summary.]

In January, 1954, olive fruits infected by *Gloeosporium olivarum* [*R.A.M.*, 32, p. 423] were received from Cassaro, Syracuse, Sicily. The disease, also found at Ferla, was present over an area of about 250 ha. at an altitude of 480 to 570 m. Infection was serious on the slopes of steep river valleys and on those exposed to the north, but the greatest damage (up to 100 per cent. infected fruits) occurred in low-lying, shady, damp situations and on trees with excessively thick foliage. Both varieties grown locally, Tonda Iblea and Nocellara Etnea [see next abstract], were affected, the former presenting a sickly appearance with premature leaf fall. Not previously recorded in Sicily, the disease appeared to have been present for three or four years, but to have caused serious loss only in the last year or two, which were marked by heavy autumn rains.

Control depends on improved cultural conditions and the provision of adequate drainage and aeration. The first fungicidal spray (1 per cent. Bordeaux mixture) should be applied before the autumn rains set in, the number of subsequent applications depending on the weather conditions; locally, two, or at most three, sprays should be sufficient. The applications will also assist in controlling *Cycloconium oleaginum* [loc. cit.; 28, p. 467; 31, p. 501], *Cercospora cladosporioides* [see below], and *Pseudomonas savastanoi* [see next abstract], which sometimes cause severe injury.

Bòttari (V.) & Spina (P.). **Le varietà di Olivo coltivate in Sicilia. Parte I.** [The varieties of Olive cultivated in Sicily. Part I.]—*Ann. Sper. agr.*, N.S., 7, 3, pp. 937–978, 7 pl., 1 fig., 1 col. map, 1953. [English summary.]

In this first part of the authors' detailed study of the olive varieties grown in the different provinces of Sicily, full descriptions are given of the seven varieties most widely cultivated in the island. The Ogliarola Messinese (or Castriciana) variety, highly resistant to knot disease [*Pseudomonas savastanoi*: *R.A.M.*, 31, p. 443 and preceding abstract], is subject to defoliation caused by *Cycloconium oleaginum* [loc. cit.], especially in irrigated or damp situations. Moresca (Morghetana) and Cerasuola are very susceptible to *P. savastanoi* when growing on high, hilly places; the former is somewhat less susceptible to *C. oleaginum*; they should not be cultivated in localities subject to frost or hail. Nocellara Etnea [loc. cit.] and Santagatese display good resistance to *P. savastanoi*, but are less resistant to *C. oleaginum*. Tonda Iblea [loc. cit.] (Cetrala) is moderately resistant to both diseases. Nocellara del Bèlice possesses little resistance to *P. savastanoi* but is moderately resistant to *C. oleaginum*.

Pettinari (Carla M.). **Diffusione, biologia e terapia di Cercospora cladosporioides Sacc., parassita dell'Olivo in Italia.** [Distribution, biology, and therapy of *Cercospora cladosporioides* Sacc., parasite of the Olive in Italy.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 10 (*1952*), pp. 233–244, 5 figs., 1953. [English summary.]

In this preliminary account of her studies on olive silver leaf (*Cercospora cladosporioides*) in Italy [*R.A.M.*, 31, p. 500], the author records for the first time the presence of the disease in the vicinity of Lake Garda, near Salò, in Umbria, and throughout most of the olive-growing area of Puglia, where it causes appreciable defoliation, especially near Brindisi and Salento. Probably no extensive olive-growing area in Italy is unaffected.

Control depends upon good cultural conditions. In severely affected areas less susceptible varieties [cf. 33, p. 679] than the 'gentili' should be planted, such as the 'leccina', grown in Tuscany and elsewhere, the 'elcina' from Liguria, and the

'carbonella' from Sabina. Spraying with neutral 2 per cent. Bordeaux mixture should be sufficiently effective if applications are made in spring (usually in May), after the first rains in August or September, and at the final picking at the end of September. The last treatment is not recommended, however, in very dry localities where the deposit is likely to remain on the fruit and contaminate the oil. Further work is in progress.

CUNNINGHAM (G. H.). **Certification of therapeutants. A guide to the buyer of insecticides and fungicides.**—*N.Z. Gdnr*, 8, pp. 832–839, 1954.

This is the 35th list of certified therapeutants for New Zealand and supersedes the last one [published in *Orchard., N.Z.*, 27, Suppl., 4 pp., 1954: cf. *R.A.M.*, 33, p. 165].

LUDWIG (R. A.), THORN (G. D.), & MILLER (D. M.). **Studies on the mechanism of fungicidal action of disodium ethylene bisdithiocarbamate (nabam).**—*Canad. J Bot.*, 32, 1, pp. 48–54, 1 pl., 1 graph, 1954.

This is a full account of studies at the Science Service Laboratory, London, Ontario, on the fungicidal activity of a crude aeration precipitate of nabam, already noticed from a shorter version [*R.A.M.*, 33, p. 166]. The fungicidal decomposition products were identified in the residue on nabam-sprayed tomato plants.

ROUT (M. K.), PADHI (B.), & DAS (N. K.). **Use of mercurated thiazoles as fungistatic agents.**—*Nature, Lond.*, 174, 4428, p. 516, 1954.

The fungicidal action of thiazole derivatives, particularly mercurated thiazoles [cf. *R.A.M.*, 32, p. 686], was studied in the Departments of Chemistry and Botany, Ravenshaw College, Orissa, India, using the assay method of Montgomery and Moore [17, p. 405] and *Alternaria polanduii* [*A. palandui*: 8, p. 217] as the test organism. Concentrations of only 2 p.p.m. of the mercurated compounds were 100 per cent. effective in inhibiting spore germination, and 100 p.p.m. of the unmercurated derivatives.

MARTIN (H.). **Chemical methods of crop protection.**—*Agric. Inst. Rev.*, 8, 2, pp. 5, 9, 1953.

The contents of the present issue of this journal, published bi-monthly by the Agricultural Institute of Canada, are entirely concerned with plant pest and disease control and include, besides the paper cited above, contributions by J. E. MACHACEK on the seed treatment of cereals and flax (pp. 25–27, 4 figs.) [*R.A.M.*, 33, p. 527]; L. C. CALLBECK on the fungicidal protection of potatoes against blight [*Phytophthora infestans*] (pp. 28–30, 3 figs.) [30, p. 243; 32, p. 665]; L. W. KOCH on the fungicidal control of root rots of tobacco and vegetables (pp. 31–32, 2 figs.) [32, p. 358; 33, p. 466]; G. C. CHAMBERLAIN on the use of fungicides on stone fruits (pp. 34–35, 3 figs.); H. R. BOYCE and C. D. MCKEEN on the maintenance of health in greenhouse crops by plant-protective treatments (pp. 36–38, 4 figs.) [32, pp. 360, 535]; J. F. HOCKEY on the safeguarding of Canada's apple crop, primarily against scab [*Venturia inaequalis*] (pp. 39–40, 3 figs.) [33, p. 467]; L. CINQ-MARS and J. G. COULSON on the effects of fungicides on crop plants (pp. 54–56, 61, 1 fig.); P. M. OVERHOLT on the registration of insecticides, fungicides, and other pesticides (pp. 60-61, 1 fig.); J. MARSHALL on the use of concentrate sprays in orchards (pp. 67–69, 3 figs.); J. L. BRANN and C. E. PALM on low-volume spray application for vegetable crops in New York (pp. 70–72, 2 figs.); H. HURTIG on the development of the use of aircraft for the application of insecticides and fungicides (pp. 73–74, 2 figs.); G. E. WALKER on aircraft and agriculture (pp. 75–76, 1 fig.); and W. S. MCLEOD on common names of insecticides and fungicides (p. 80).

Kendrick (J. B.) & Middleton (J. T.). **The efficacy of certain chemicals as fungicides for a variety of fruit, root and vascular pathogens.**—*Plant Dis. Reptr*, 38, 5, pp. 350–353, 1954. [Multilithed.]

The authors emphasize the need for adequate laboratory screening of fungicidal chemicals before field tests are made, and point out that spore germination tests [*R.A.M.*, 33, p. 679] yield no information on the effectiveness of a fungicide in the soil. At the Citrus Experiment Station, Riverside, California, a number of chemicals were screened against a wide range of soil-borne pathogens and against some citrus and tomato fruit pathogens (14 in all). The fungicidal and fungistatic levels of the materials were determined by placing inoculum disks on plates of potato dextrose agar containing the chemicals at concentrations of 10, 100, and 1,000 p.p.m. The more promising materials were then tested against some or all of the fungi by Zentmyer's soil drench test (*Phytopathology*, 42, p. 26, 1952), inoculum disks being buried for 24 hours in sterile soil drenched with the fungicide solutions, retrieved, and examined for growth on agar plates.

Compound N–521 (3,5-dimethyl-tetrahydro-1,3,5-2H-thiadiazine-Z-thione: Stauffer Chemical Company) at 100 p.p.m. was consistently effective in both tests against all the organisms except *Penicillium digitatum*, though compound 974 of the same chemical composition was ineffective in plate tests. The chlorinated nitrobenzenes 1194 and 1197 (Mathieson Chemical Company) were effective in agar at 10 p.p.m., the latter even more so than N-521, but less satisfactory in soil. Nabam and vancide 51W were consistently effective in soil against almost all of the test fungi, but only at 1,000 p.p.m. None of the other compounds offered any promise when applied to the soil as a water drench.

Zeumer (H.). **Methoden zur Prüfung von Pflanzenschutzmitteln LVI. Die Bestimmung der Haftfestigkeit von Stäubemitteln.** [Methods for the assay of plant protectives LVI. The determination of the adhesion of dusts.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), *Stuttgart*, 6, 2, pp. 17–23, 2 figs., 2 diags., 1954.

A procedure for the determination of the adhesion of plant-protective dusts [*R.A.M.*, 33, p. 164] is fully described. A modified form of the Görnitz-Voelkel nirosta plate apparatus (*Anz. Schädlingsk.*, 3, pp. 101–103, 1925; *Arb. biol. Abt.* (*Anst.–Reichsanst.*), *Berl.*, 17, pp. 253–272, 1930) and a method of assay, yielding reproducible and comparable values under diverse climatic conditions with various types of equipment and different preparations, were used. All values were based on a 50 per cent. adhesion of normal talcum Luv Superior No. 9976.

Rich (S.). **Dynamics of deposition and tenacity of fungicides.**—*Phytopathology*, 44, 4, pp. 203–213, 7 graphs, 1954.

Field trials are reported from Connecticut Agricultural Experiment Station, using Horsfall and Rich's randomized spiral plots (*Bull. Conn. agric. Exp. Sta.* 530, 1949), to determine the effect of spray concentration on the initial deposition and subsequent weathering of three fungicides on bean [*Phaseolus vulgaris*] and celery, representing the hairy- and smooth-leaved plant types. The sprays, applied weekly at 250 lb. pressure per sq. in. and 200 gals. per acre, were Bordeaux mixture at concentrations ranging from 1–0·5–100 to 11·2–5·6–100 on bean and from 1·4–0·7–100 to 11·2–5·6–100 on celery, and zineb (dithane Z-78) and tank mix zineb (nabam (dithane D-14) plus zinc sulphate) at dosages between 0·28 and 3·24 lb. per 100 gals. for beans and 0·4 and 3·24 for celery.

On the Bordeaux-treated plants there were smaller increments of initial spray deposit with increasing concentrations [cf. *R.A.M.*, 14, p. 606; 25, p. 128], a relationship which is attributed to adsorption of the spray particle by the leaf

surface. With further increases in spray concentration the adsorptive capacity of the leaf surface approached saturation and the unadsorbed particles were presumably lost in the run-off. On the other hand, the accumulation of zineb deposits was roughly proportional to the concentration of spray material in the tank, probably because adsorptive forces are not concerned in their formation. The celery leaves retained more zineb deposit than did the bean, whereas about the same amounts of Bordeaux were retained by both types of foliage. These disparities are ascribed to the fact that a zineb suspension spreads more rapidly on celery than on bean leaves, whereas Bordeaux spreads equally well on both.

In the weathering of dried Bordeaux deposits, the larger the initial deposit, the smaller was the percentage lost, indicating that the particles cohere more strongly together than to the leaf surface. With zineb, however, the process was exactly reversed. The dried particles, therefore, must adhere more strongly to the leaf surface than to each other. Irrespective of the material used, deposits on bean leaves took longer to weather than those on celery [cf. 33, p. 364].

There are two physical differences between Bordeaux and zineb which might account for the unequal accumulation and weathering of the residues. One is that Bordeaux particles carry a positive and those of zineb a negative electro-kinetic charge, and the other that Bordeaux suspensions are hydrophilic and those of zineb hydrophobic. The processes of zineb deposition and weathering were identical whether the original spray was a formulation of wettable powder or a nabam mix.

The application of these data to improvements in the efficiency of field spraying is briefly discussed.

Angelotti (R.), Fletcher (J. A.), Brown (H. D.), & Weiser (H. H.). **Detection of fungicides and insecticides by microbiological techniques.**—*Proc. Amer. Soc. hort. Sci.*, 63, pp. 285–288, 1954.

In an attempt at Ohio State University, Columbus, to devise a microbiological technique for assaying spray residues on crops [*R.A.M.*, 33, p. 680], various bacteria, including *Erwinia carotovora*, yeasts, and protozoa were tested with dithane, DDT, BHC, lindane, and parathion. The response of *Micrococcus pyogenes* var. *epidermidis* indicates that it might be used for the assay of fungicides. It was inhibited by dithane at 3·3 p.p.m. The other organisms showed no obvious differential responses to the materials under test.

Wilson (J. D.) & Miller (J. B.). **Polyelectrolytes as spray conditioners.**—Abs. in *Phytopathology*, 43, 9, p. 489, 1953.

In tests [at Ohio Agricultural Experiment Station, Wooster] the adhesion of tribasic fixed copper sprays to tomato leaves and the suspensibility of the fungicide in water after thorough mixing were materially increased by the use of various polyelectrolytes, especially alkaline polymers of high viscosity and high molecular weight. The adhesive action of acid polymers was improved by neutralization with sodium carbonate or ammonium hydroxide. Equally satisfactory results were obtained with a standard soil-conditioner formulation which can be prepared as a 325-mesh powder and stored with fixed coppers.

Schatz (A. S.) & Riccitelli (R. C.). **Catálogo de cultivos del Instituto de Microbiología Agrícola.** [Catalogue of cultures at the Institute of Agricultural Microbiology.]—*Misc. Publ. Minist. Agric., B. Aires*, 5, 40 pp., 1952.

This is a revision to December, 1951, of the catalogue of cultures maintained at the Institute of Agricultural Microbiology, Buenos Aires [*R.A.M.*, 30, p. 333], numbering over 2,000.

Luttrell (E. S.). **Incite, incitant, incitement.**—*Plant Dis. Reptr*, 38, 5, pp. 321–322, 1954. [Multilithed.]

The author discusses the growing incorrect use in plant pathological literature of the terms 'incite' and 'incitant' in referring to the cause of a disease and considers that 'cause' is the only adequate and exact known term.

Pady (S. M.) & Kelly (C. D.). **Aerobiological studies of fungi and bacteria over the Atlantic Ocean.**—*Canad. J. Bot.*, 32, 1, pp. 202–212, 1954.

Further information is presented on the organisms trapped by the McGill General Electric and slit samplers and a filter during two transatlantic flights in 1951 [*R.A.M.*, 32, p. 494]. Over the ocean a maximum of 3·9 fungus spores per cu. ft. was recorded in polar air compared with 15·1 in tropical, whereas over Eastern Canada the maximum in tropical air was 361·4. Of the 4,991 colonies examined *Cladosporium* comprised 82·3 per cent., *Alternaria* 2·6, *Pullularia* 2·3, yeasts 2·1, *Penicillium* 1·6, *Botrytis* 1·5, and *Stemphylium* 1·1.

Bremer (H.) & Özkan [M.]. **Problèmes ayant trait à la pathologie des plantes agraires cultivées en Turquie, posés par la nature même du pays.** [Problems concerning the pathology of field crops grown in Turkey posed by the very character of the country.]—*Rev. Path. comp., 1952*, 640, pp. 463–471, 1952.

In this paper, presented at the Fifth International Congress of Comparative Pathology held at Istanbul from 13th to 20th May, 1949, the authors discuss the influence of environmental and geographical factors on the incidence and severity of plant diseases in Turkey [*R.A.M.*, 32, p. 545], with reference to specific pathogens.

Jamalainen (E. A.). **Overwintering of cultivated plants under snow.**—*F.A.O. Pl. Prot. Bull.*, 2, 7, pp. 102–105, 1954.

Investigations by the Department of Plant Pathology, Agricultural Research Centre of Finland, into damage by fungi to cultivated plants overwintering under snow [*R.A.M.*, 31, p. 556] showed that in the southern, south-western, and western parts of the country, where the snow cover is often thin or absent for most of the winter, damage by parasitic fungi is uncommon, because of deep freezing of the soil, though cold injury may be severe. In the remainder of the country, however, where the ground is usually deeply covered in winter, overwintering plants generally suffer severe losses, not from cold, but from parasitic fungi, the most important of which have been noticed from time to time in this *Review* [loc. cit.; 30, p. 44; 32, p. 239, *et passim*].

The winter wheat varieties commonly grown, such as Olympia and Varma, are moderately resistant to snow mould (*Fusarium nivale*) [*Calonectria nivalis*: 30, pp. 273–4]; the winter rye varieties appear to be fairly resistant to *Typhula borealis* and *T. itoana*, though winter wheat is susceptible and sometimes completely destroyed during overwintering. The poor survival of winter wheat on sandy soil is at least partly due to these fungi. The winter rye varieties most resistant to parasitic fungi in Finland are Ensi, Toivo [loc. cit.], the local strain Greus, and Vjtaka, introduced from northern Russia. Rather less resistant are Pekka, Oiva, and Onni [loc. cit.], which are best suited to the southern and western parts.

Observations made in test cultivations indicated that susceptibility to *C. nivalis* would appear to be the chief factor limiting the cultivation of winter barley in Finland. The ley grasses grown locally, especially timothy (*Phleum pratense*) [cf. loc. cit.], are moderately resistant to *C. nivalis*, *Typhula* spp., and *Sclerotinia borealis*, but this does not apply to all strains. Some imported strains are very

susceptible to *S. borealis*. Most strains of *Lolium perenne* [cf. loc. cit.] are destroyed by snow mould and other parasitic winter fungi, but the Valinge strain is resistant.

The cultivation of red clover (*Trifolium pratense*), the commonest species in Finland, is made difficult by its unreliable overwintering. *S. trifoliorum* [29, p. 621; 33, p. 485], which occurs throughout Finland, even north of the Arctic Circle, is the most important of the fungi attacking clover. It may cause considerable loss and in some years complete destruction of the wintering host. When the disease is very prevalent no strains escape damage, though Tammisto and some other Finnish strains are more resistant than imported strains.

In the central and eastern parts of the country losses caused to winter turnip rape (*Brassica campestris* var. *oleifera* f. *biennis*) by *Typhula* spp. and *S. sclerotiorum* [cf. 27, p. 498] have been so great that cultivation of this crop is now confined to the southern and western areas.

Further work is required on parasitic winter fungi and their biology and geographical distribution, particularly the pathogenicity of the different species and their physiological races. More information is needed on their temperature requirements and on the reactions of different plant species, varieties, and strains to such fungi and to cold.

The application of results of research.—vii+212 pp., London, Butterworth's Scientific Publications, 1954. 21*s*.

In this book, compiled and edited by Vera Connell in collaboration with the British Commonwealth Scientific Offices (London), are reviewed the methods adopted by the Commonwealth countries for promoting the application of the results of scientific research. The information was the substance of a report of the British Commonwealth Scientific Conference held in Australia in 1952. The aspects dealt with are the conventional and special methods adopted to ensure wide knowledge of the results of research and facilitate their immediate application, and the obstacles to the use of information. The conclusions of the inquiry are summarized.

Peterson (E. A.). **A study of cross antagonisms among some actinomycetes active against Streptomyces scabies and Helminthosporium sativum.**—*Antibiot. & Chemother.*, 4, 2, pp. 145–149, 1 graph, 1954.

At the Bacteriology Division, Department of Agriculture, Ottawa, Canada, the author studied the interrelationships of 46 soil actinomycetes selected from a collection of 509 for their ability to produce intense inhibition of *Streptomyces* [*Actinomyces*] *scabies* [*R.A.M.*, 32, p. 665] and *Helminthosporium sativum* [33, p. 627]. A wide range of cross-antagonisms was found to exist within the group. Of special interest as potential agents of biological control were cultures E 63, D 60, D 39, and E 31, which showed considerable resistance to antagonism as indicated by relatively low susceptibility indices.

The irradiation of selected cultures with ultra-violet light did not give rise to mutants with greater antibiotic activity or higher resistance to antagonism than the parents.

Jeffers (W. F.). **Use of actidione in culture of plant pathogenic bacteria.**—*Phytopathology*, 44, 3, p. 144, 1954.

At the Department of Botany, University of Maryland, the author investigated the reactions of some bacterial plant pathogens and mould contaminants of cultures [see next abstract] to actidione [*R.A.M.*, 30, p. 184], which was added to a nutrient dextrose agar medium at concentrations ranging from 0·1 to 1,000 μgm. per ml.

Agrobacterium [*Bacterium*] *tumefaciens*, *Erwinia carotovora*, *Pseudomonas solanacearum*, and *Xanthomonas campestris* made good growth at all the levels of antibiotic tested, but *Neurospora sitophila*, *Penicillium italicum*, *Rhizopus nigricans*

[*R. stolonifer*], and *Trichoderma viride* made no growth in the presence of 100 μgm. during a period of nine days, after which slight development was observed.

Aspergillus niger was more tolerant of actidione than the other moulds, making a trace of growth at a concentration of 1,000 μgm.

From these results the use of actidione would appear to be a valuable adjunct in the isolation of phytopathogenic bacteria.

Ōnishi (H.). **Studies on Soy yeasts. Part I. Methods for determining viable counts of yeasts separating from mixed culture with moulds.**—*J. agric. chem. Soc. Japan*, 28, 2, pp. 134–140, 1954. [Japanese, with English summary.]

Counts of yeasts isolated from soy [-beans] were greatly facilitated by the addition of 2 per cent. sodium propionate to the koji [yeast] extract agar adjusted to pH 4·6 which inhibited the growth of fungi on the plates [*R.A.M.*, 30, p. 382 and preceding abstract].

Douglas (R. J.) & Garrard (E. H.). **A simple serological test for certain actinomycetes.**—*Canad. J. Bot.*, 32, 1, pp. 38–39, 1 pl., 1954.

A serological technique for differentiating between certain actinomycetes [*R.A.M.*, 28, p. 644], in which satisfactory flocculation occurs with extracts from homogenized mycelium and rabbit serum, is described.

Staffeldt (E. E.) & Sharp (E. L.). **Modified lyophil method for preservation of Pythium species.**—*Phytopathology*, 44, 4, pp. 213–215, 1954.

In the tests herein reported from the Department of Botany, Iowa State College, Ames, healthy, unbroken Clinton oat straws were impregnated with water under evacuation, steam-sterilized for 45 minutes at 15 lb. pressure, placed on two-day-old carrot agar cultures of *Pythium* spp., and left there until oogonia were formed in profusion, when they were cut into 1-cm. pieces and transferred to lyophil tubes [cf. *R.A.M.*, 33, p. 245]. Two main methods of processing were applied, one of which involved freezing at −45° C. by immersion in a dry-ice acetone bath, the temperature of which was either allowed to rise slowly to that of a room or brought up immediately to −10° or −20° for a subsequent three-hour drying period. Finally, the tubes were exposed at room temperature for half-an-hour before sealing under vacuum. In the other procedure the tubes were kept at room temperature for the entire three-hour drying period. Viability tests involved rehydration of the straws in a saturated moist chamber for 12 to 60 hours and transference to carrot agar.

In the nine species of *Pythium* under investigation oogonia were produced by *P. acanthicum*, *P. irregulare*, *P. paroecandrum*, *P. debaryanum*, and *P. aphanidermatum*; sporangia by *P. rostratum*, *P. splendens*, and *P. arrhenomanes* [33, p. 608]; and mycelium by *P. graminicola*.

All the processing methods used were successful with *P. acanthicum*, but the lots dried at −10° and at room temperature required less time (one to four days) for the initiation of growth than those dried at −20° (a week or more). All tests (22) were positive with this species and with *P. irregulare* (7). Three samples each out of 11 of *P. paroecandrum* and *P. debaryanum* survived lyophilization, though more than a week elapsed before development commenced. The other species gave uniformly negative results. *P. acanthicum* had remained viable for 14 months in storage at the time of writing. The use of blood serum, agar, and gelatin as storage media failed to yield viable cultures.

Kosikov (K. V.). Новый метод выделения отдельных клеток микроорганизмов. [A new method for isolating individual cells of micro-organisms.]—Микробиология [*Microbiology, Moscow*], 21, 4, pp. 449–452, 1 pl., 2 figs., 1952.

A description is given of a method, developed at the Institute of Genetics,

U.S.S.R. Academy of Sciences, Moscow, for the rapid isolation of many individual cells of micro-organisms [cf. next abstract]. This method requires a moist chamber consisting of a glass ring 1 mm. thick, 15 to 16 mm. in diameter, and 15 mm. high, with a glass side tube 10 mm. in diameter and 15 mm. long leading into it. The ring is fastened to a glass slide with a mixture of wax and vaseline (3 to 1) and covered with a coverslip. The holder of a platinum dissecting needle rests on a slot fixed in a wax block standing on the microscope stage, the needle passing through the glass side tube into the ring.

Stević (B.). Једноставан прибор за издвајање микроорганизама. [A simple device for isolating micro-organisms.]—Зборн. Радова пољоп. Фак., Београд [*Rev. Res. Work Fac. Agric., Beograd*], 1, 2, pp. 214–219, 1 fig., 1953. [English summary.]

A simple device, consisting of a microscope stage set on a special pillar so that it can be moved up and down and to the right and left, was designed at the Institute for Microbiology, Beograd, to facilitate the isolation of micro-organisms [cf. preceding abstract]. The microneedle and other micro-equipment are held by a bar attached to the device by means of a groove and screw. A conical screw attached to the right end of the bar allows the fine up and down movement of the microneedle. A glass chamber moves with the microscope stage. The isolation of conidia in the chamber [loc. cit.] takes a few minutes.

Everton (J. R.) & Bashford (T. E.). **Susceptibility to mould growth of wad materials used in glass jar and bottle closures.**—*Proc. Soc. appl. Bact.*, 15 (*1952*), 1, pp. 94–102, 1 diag., 1953. [Received October, 1954.]

Experiments carried out by the Metal Box Company Ltd., Research Division, London, W. 3, with *Aspergillus niger* and *Chaetomium globosum* as test organisms, showed that the resistance of felt board and wood pulp board to fungal attack when used as wads in bottle caps is not due to the presence of fungistatic substances in these materials. The latter material is pure cellulose, the naturally occurring minerals essential for mould growth having been removed, presumably during manufacture. Mould was not found on felt material in an atmosphere of 76 per cent. relative humidity at either 20° or 30° C. The humidity at the interface between cap and felt wad was about 69 per cent. which is probably below the minimum necessary for mould growth. It was also demonstrated that owing to the close contact between the felt wad and the cap, mould growth was largely prevented by mechanical restriction. Cork wads [*R.A.M.*, 31, p. 346] curve away from the cap, leaving cavities within which moulds can proliferate.

Painter (H. A.). **Factors affecting the growth of some fungi associated with sewage purification.**—*J. gen. Microbiol.*, 10, 1, pp. 177–190, 1 pl., 8 graphs, 1954.

Various aspects of the nutrition of four fungi which commonly inhabit percolating filters treating sewage [*R.A.M.*, 33, p. 246] were studied at the Water Pollution Research Laboratory, Watford, Herts. An undescribed species of *Sepedonium*, the predominant fungus, required organic sources of nitrogen, while *Fusarium aqueductum* [loc. cit.], *Geotrichum* sp. [cf. loc. cit.], and *Trichosporon cutaneum* utilized ammonium salts; *F. aqueductum* also utilized nitrate. The last-named and *Geotrichum* needed no external supply of vitamins but *T. cutaneum* required thiamine and the *Sepedonium* thiamine and biotin for optimum growth. This was secured at pH 7 to 8·5 for the *Sepedonium* and pH 3 or 4 to 9 for the others. Zinc, calcium, manganese, and probably iron and copper were required by the *Sepedonium*; it was the only species inhibited by concentrations of zinc above the optimum (4 to 10 p.p.m.) in media partially deficient in other elements. Magnesium, iron, or

copper in combination with zinc counteracted the inhibitory effect but calcium increased it.

Rose (Grace R.) & Bayley (C. H.). **The stability to water leaching of some textile fungicides applied to unlined Flax forestry fire hose.**—*Text. Res. J.*, 24, 3, pp. 229–234, 1954.

Of six compounds tested at the Textile Research Section, National Research Laboratories, Ottawa, Canada, for the protection of unlined flax forestry fire hose against [unspecified] fungal damage [cf. *R.A.M.*, 33, p. 60], the most effective were two containing copper 8-hydroxyquinolinolate as their active ingredient. At 2 per cent. (0·036 per cent. copper) one of these conferred a measure of protection equal to that of 13 per cent. copper naphthenate (1·04 per cent. copper). Moreover, the adverse effects of copper 8-hydroxyquinolinolate on various physical properties of the hose were much less pronounced than those of the otherwise satisfactory copper naphthenate.

Melin (E.) & Nilsson (H.). **Transport of labelled phosphorus to Pine seedlings through the mycelium of Cortinarius glaucopus (Schaeff. ex Fr.) Fr.**—*Svensk bot. Tidskr.*, 48, 2, pp. 555–558, 1 diag., 1954.

In a further contribution from the Institute of Physiological Botany, University of Uppsala, Sweden [*R.A.M.*, 32, p. 268], the authors demonstrate the transfer of labelled phosphorus (P^{32}) to pine (*Pinus sylvestris*) roots via the mycorrhizal mycelium of *Cortinarius glaucopus* [33, p. 371]. The older, non-mycorrhizal parts of the lateral roots also showed relatively high activity, indicating that the isotope was transferred from the fungus to the root cells. It was also translocated to the aerial parts of the seedlings.

Morrison (T. M.). **Uptake of phosphorus-32 by mycorrhizal plants.**—*Nature, Lond.*, 174, 4430, pp. 606–607, 1954.

In the Department of Botany, University of Otago, New Zealand, the leaves of intact, mycorrhizal *Pinus radiata* seedlings contained more radioactive phosphorus (P^{32}) [cf. *R.A.M.*, 33, p. 494 and preceding abstract], applied to the roots in solution, than those of non-mycorrhizal seedlings, but mycorrhiza had little effect on phosphorus uptake by *Nothofagus menziesii* under similar conditions.

Winstead (N. N.) & Walker (J. C.). **Production of vascular browning by metabolites from several pathogens.**—*Phytopathology*, 44, 3, pp. 153–158, 1954.

At the Department of Plant Pathology, University of Wisconsin, the filtered washings from wheat bran cultures of the wilt-inducing organisms *Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici* from tomato [*R.A.M.*, 33, p. 692], race 1 of *F.o.* f. *conglutinans* [*F. conglutinans*] from cabbage, *F.o.* f. *vasinfectum* [*F. vasinfectum*] from cotton [see next abstract], and races 1 and 2 of *F.o.* f. *pisi* from peas showed high activity of pectin methylesterase and low of polygalacturonase [33, p. 388] and their filtrates caused vascular browning in all the test plants, when introduced into the cut stems of resistant and susceptible varieties. Similar results were obtained, respectively, with *F. solani* f. *pisi*, *F.s.* f. *phaseoli*, and a strain of *F. oxysporum* responsible for root rots of pea, bean [*Phaseolus vulgaris*], and brome [*Bromus* sp.: 33, p. 691].

The maximum degree of pectin methylesterase activity was found in potato dextrose broth cultures of *Pseudomonas solanacearum*. The copious production of pectin methylesterase and the relatively high proportion of polygalacturonase in the bacterium (as compared with the *F.* spp.) may partially account for the rapid spread of *P. solanacearum* in tomato and its many other hosts.

Bran culture filtrates of *Botrytis cinerea* were rich in both enzymes but not those

of *Alternaria solani*; the former induced some browning and soft rot in tomato stems. Replacement culture filtrates of all the organisms under observation were low or lacking in enzymatic activity, which was absent, moreover, from filtrates heated for ten minutes at temperatures exceeding 60° C.

Since the browning factor was common to all the wilt and root-rot pathogens and non-specific for their respective susceptible hosts, establishment of the fungus in the host must be assumed to rely on factors other than pectin methylesterase activity. After invasion of the xylem, however, the enzyme appears to be important in the development of vascular browning and occlusion.

WINSTEAD (N. N.) & WALKER (J. C.). **Toxic metabolites of the pathogen in relation to Fusarium resistance.**—*Phytopathology*, 44, 3, pp. 159–166, 3 figs., 1954.

In further studies at the Department of Plant Pathology, University of Wisconsin [see preceding abstract], *Fusarium oxysporum* f. *conglutinans* races 1 and 2 [*F. conglutinans*: *R.A.M.*, 33, p. 130] and *F.o.* f. *vasinfectum* [*F. vasinfectum*] produced in culture metabolites specific in their action on cabbage, radish, and cotton, respectively, growing in quartz sand watered with Hoagland's nutrient solution.

Susceptible Copenhagen Market cabbage plants, having four or more expanded leaves at the onset of root treatment with replacement culture filtrates at various dilutions, developed within 48 hours vein-clearing and yellowing of the cotyledons and lower leaves suggesting the earliest symptoms of yellows. Applied to resistant Jersey Queen plants, the same treatment was without effect. Susceptible Early Scarlet Globe radishes at the 6- to 14-leaf stage treated with replacement filtrates of either race of *F. conglutinans* showed the same kind of external symptoms as infected plants, whereas the resistant breeding line 39–52 reacted negatively. Filtrates of *F. conglutinans* race 2 were innocuous both to the resistant and susceptible cabbage varieties. Susceptible Stoneville cotton plants treated with filtrates prepared from mycelial mats of *F. vasinfectum* also developed external symptoms similar to those of infected plants, while the resistant Coker 100 remained healthy. In tests with filtrates of *F. vasinfectum*, *F. conglutinans* races 1 and 2, *F.o.* f. [*F. bulbigenum* var.] *lycopersici* from tomato, and *Fusarium* from wilted pea on cotton, cabbage, and radish, and with *F. vasinfectum* and *F. conglutinans* races 1 and 2 on pea and tomato, the effects were invariably specific for the susceptible varieties of the several hosts.

The metabolites of *F. conglutinans* races 1 and 2 and of *F. vasinfectum* induced no vascular browning in the susceptible cabbage, radish, and cotton varieties which developed external symptoms. The metabolites were dialysable, thermostable, unaffected by concentration or changes of pH from 1 to 12, and not precipitable by ethyl alcohol. They all appear to be of low molecular weight and to be concerned in some way with the establishment of the respective pathogens in susceptible varieties.

YARWOOD (C. E.), SIDKY (S.), COHEN (M.), & SANTILLI (V.). **Temperature relations of powdery mildews.**—*Hilgardia*, 22, 17, pp. 603–622, 16 graphs, 1954.

The existing quantitative data on the temperature relations of powdery mildews (Erysiphaceae) are reviewed. The optimum temperature for powdery mildews as a group is about 21° C., i.e., about 4° lower than the average optimum for plant pathogens. The optima determined were: 17° for *Erysiphe graminis* from barley [cf. *R.A.M.*, 26, p. 194; 33, p. 76], 22° for *E. cichoracearum* from cantaloupe and cucumber, 23° for *E. polygoni* from pea, bean (*Phaseolus vulgaris*), and clover, and 26° for *Uncinula necator* from vine. The criteria of fungus activity, namely, number of conidia per conidiophore, rate of maturation of conidia, their percentage germination [25, p. 280; 30, p. 384], length of germ tubes *in vitro*, disease development, and length of hyphae *in vivo*, used to assay the relation of temperature to

powdery mildew development, are considered to be of increasing merit in the order given. The longevity of powdery mildew conidia is about two days in normal environments and is shorter than for spores of most fungi. Attached spores *in situ* live longer than detached ones on glass. Fresh conidia on the host surface tolerate higher temperatures than young colonies arising from them.

KOMMEDAHL (T.). **Spore germination in Ustilago zeae as influenced by KH_2PO_4.**—*Mycologia*, 46, 2, pp. 151–156, 1954.

In experiments at Ohio Agricultural Experiment Station, Wooster, when the usual amount of potassium dihydrogen phosphate in Czapek's medium (1 gm. per l.) was increased 16 to 32 times, germination of the chlamydospores of *Ustilago zeae* [*U. maydis*: *R.A.M.*, 32, p. 427] was reduced by up to 30 per cent. The effect was most marked when the spores were exposed to this medium for 20 to 30 days at 3° C. and then incubated at 27° for 24 to 28 hours.

Beta radiation from radiophosphorus (P^{32}) in potassium dihydrogen phosphate at initial specific activities of up to 40 μc. per ml. did not affect the number of spores that germinated.

SUSSMAN (A. S.). **The sensitization of ascospores to chemical activators by heat treatment.**—*Mycologia*, 46, 2, pp. 143–150, 4 graphs, 1954.

After stating that fresh ascospores of *Neurospora* germinate in response to catalytic amounts of furfural and certain related chemicals, but old ones resist such treatment, the author describes experiments at the Department of Botany, University of Michigan, Ann Arbor, in which exposure of ascospores of *N. tetrasperma* stored for periods of up to 28 months to temperatures between 38° and 50° C. for one hour or less increased the activating effect of furfural and other chemicals. Aerobic incubation of heat-treated ascospores induced rapid loss of sensitivity to furfural, though such sensitivity was retained for longer periods when oxygen supply was restricted. Heat sensitization appeared to be accompanied by a two- or threefold increase in respiratory rate, but it is doubtful whether the increased oxygen intake was responsible for the increased sensitivity.

FRIES (N.). **The response of some hymenomycetes to constituents of nucleic acids.**—*Svensk bot. Tidskr.*, 48, 2, pp. 559–578, 10 graphs, 1954.

In studies at the Institute of Physiological Botany, University of Uppsala, Sweden, the stimulatory effect of adenine on the growth of *Polyporus* [*Polystictus*] *abietinus*, *Polyporus* [*Fomes*] *annosus*, *Mycena flavo-alba*, and *M. rubromarginata* [cf. *R.A.M.*, 30, p. 65] was apparent under all experimental conditions, viz., with various carbon and nitrogen sources, on semi-solid and liquid media, at different incubation temperatures, and with inocula of different ages. Adenine also enhanced the economic coefficient in *Lentinus lepideus* and *F. annosus* without necessarily affecting the lag phase or growth rate.

DAVIDSON (T. R.) & SANFORD (G. B.). **Effect of age of Potato foliage on expression of leaf-roll symptoms.**—*Canad. J. Bot.*, 32, 2, pp. 311–317, 1 graph, 1954.

An intensive field experiment was conducted at Edmonton, Alberta, from 1949 to 1952 to study the expression of leaf roll virus symptoms in potato plants of various ages [*R.A.M.*, 33, p. 466]. Healthy Netted Gem, Carter's Early Favourite, and Canus plants were graft-inoculated with infected Canus scions at ten-day intervals from 10th June to 15th September and protected from viruliferous aphids by frequent spraying with a mixture of DDT and nifos-T. Plant infection was verified by the tuber-index method.

Leaf roll symptoms were regularly severe on young plants and affected a high percentage of them. However, both severity and incidence gradually decreased

until about 15th August, after which the infected plants appeared healthy and the percentage actually infected declined sharply. It appears, therefore, that plants infected after mid-season normally do not develop definite foliage symptoms and thus cannot be detected by ordinary field inspection.

MacCarthy (H. R.). **Aphid transmission of Potato leaf roll virus.**—*Phytopathology*, 44, 4, pp. 167–174, 1 fig., 1 graph, 1954.

At the University of California Agricultural Experiment Station, Berkeley, 83 per cent. of non-infective, apterous, single adults of *Myzus persicae*, after feeding for at least five days on newly emerged potato plants infected with leaf roll virus, transmitted the disease to about 70 per cent. of *Physalis floridana* seedling indicators [*R.A.M.*, 27, p. 493; 33, p. 442]. Alatae, fed for five days or longer on infected potato plants, were found to be capable of transmitting the virus for as long as they lived. A period of up to 24 days on an immune host, e.g., *Brassica juncea*, intervening between the acquisition and inoculation feedings, did not destroy the virus within the aphid. With single aphids the acquisition threshold period was found to be two hours and the inoculation threshold 30 minutes, but for one individual to perform both operations a 12-hour transmission threshold period was necessary, comprising a four-hour acquisition and an eight-hour inoculation feeding. The individual inoculation of 176 *P. floridana* plants by 26 apterous adults of *M. ornatus* resulted in 41 infections.

Of six species of *Physalis* (besides *P. floridana*) and four other plants tested as indicators, *P. angulata*, *Datura stramonium*, and its var. *tatula* [*D. tatula*] were susceptible, *P. philadelphica* and tomato were slightly susceptible, and *Lycopersicon pimpinellifolium* was a symptomless carrier. The latent period was shown to range from 9½ to 120 hours in individual aphids.

Norris (D. O.). **A note on the transmission of Potato virus X in the field.**—*J. Aust. Inst. agric. Sci.*, 20, 1, pp. 56–57, 1954.

In plot tests to determine the resistance of different potato varieties to natural infection by virus X, carried out at Canberra during 1948–9 and 1949–50, five varieties free from virus X were used, a single plant in each unit of 11 plants being inoculated with the virus when 6 in. high. Katahdin and Sebago were highly resistant to mechanical infection and to core-grafting, all but one Sebago failing to become infective. Snowflake appeared to be much more susceptible [to natural infection] than Bismark or Up-to-Date. The distribution of infection did not suggest plant to plant contact, but was of a random nature, indicating the possibility of an active vector.

In 1952–3 a plot was planted with 340 tubers, 6 links apart each way, of élite, virus-free Up-to-Date. In each row the 1st, 22nd, 64th, and 85th plant was an infective Brownell, each being covered with an animal-proof wiremesh frame. No cultivation was carried out. After harvest one plant four places distant from an infector was found to contain virus X. This is regarded as an instance of insect transmission.

Schober (K.). **Die Bedeutung des Saatgutwechsels zur Verhütung der Kartoffelabbaukrankheiten.** [The significance of rotation of 'seed' in the prevention of degeneration diseases in potatoes.]—*Pflanzenarzt*, 7, 4, pp. 3–4, 1954.

Three years of experiment by the College of Soil Science, Grossenzersdorf, Austria, in growing potato plants from the 'seed' of the previous crop showed a reduction in yield from 100 per cent. to 64 and 59 per cent. for the two varieties Ackersegen and Allerfrüheste Gelbe, respectively [cf. *R.A.M.*, 31, p. 624]. The author recommends a change of seed potatoes every second year in the district of Eastern Austria most affected by virus diseases, and in other regions every third year.

Gardner (W. S.). **Curly top of the Potato in Utah and its possible relationship to 'haywire'.**—*Plant Dis. Reptr*, 38, 5, pp. 323–325, 2 figs., 1954. [Multilithed.]

On the basis of observations and experiments in Utah and a review of the literature the author suggests that potato 'haywire' [*R.A.M.*, 28, p. 480] is caused by potato [beet] curly top virus [33, p. 497], the disease having escaped positive identification because of the great variation in populations and migrations of the vector [*Eutettix tenella*], difficulties in transmission of the virus to potato, the wide variation in symptoms, and the fact that only some of the tubers from a diseased plant carry the virus.

Todd (J. M.). **Potato wildings and witches' broom in Scotland.**—*Plant Path.*, 3, 1, pp. 17–20, 1 pl., 1954.

These studies were undertaken to clear up the existing confusion in the status of potato 'wilding' and witches' broom in Scotland [*R.A.M.*, 12, p. 48; 15, p. 460; 20, p. 30; 31, p. 628]. Though many potato variants behave like periclinal chimeras, wildings are not in this category. They rarely flower, and produce more seed-size tubers than do normal plants and can therefore increase rapidly in a stock; some non-certified stocks of standard varieties consist largely of wildings. Wilding plants are known with certainty only from the British Isles and western Europe. The condition is apparently not graft-transmissible.

Witches' broom is sporadic in Scotland, and is seldom present in any crop as a calculable percentage. The first symptom in the field is usually the presence of seemingly 'drawn' plants, each having several stems bearing simplified leaves with yellow margins. Tubers from such plants develop hair sprouts from every eye and if planted in the usual manner produce late-appearing, many stemmed, dwarf plants presenting the same symptoms. Cockerham (*in litt.*) has found that such plants, if not in excessive shade, eventually grow larger. The vegetative progeny sometimes repeat the symptom sequence shown by the parent, but often reach average height.

In transmission experiments at the Plant Pathology Station, East Craigs, Edinburgh, dwarfed shoots from witches' broom Kerr's Pink plants were grafted to young shoots or sprouts of several British varieties. The incubation periods were long and no symptom was seen on current growth, except on some plants which had been cut back to produce second growth. Some of these plants eventually produced a mass of thickly proliferated stems with typical symptoms and nodal bunches of much-branched aerial stolons on the older parts [cf. 32, p. 334]. The tubers from grafted plants produced thin-stemmed plants with simplified leaves having some marginal yellowing. These plants in turn formed many very small tubers, which when left in the pot rapidly produced a mass of chickweed-like growth, from which a few stems gradually tended to assume a normal appearance.

The virus of the Scottish form of witches' broom was also transmitted by grafting to tomato and *Nicotiana glutinosa* and was recovered in potato. No symptoms were shown by *N. glutinosa*. In occasional tomato plants marginal yellowing and downward leaf curling [cf. 8, p. 122] developed after at least three months' incubation, and only after cutting back once or twice. No symptoms appeared on grafted plants of *Solanum demissum* and tobacco.

The virus of witches' broom found in Scotland differs from the two viruses present in the north-western United States [11, p. 667; 13, p. 257; *et passim*] and British Columbia [32, p. 334], respectively, with respect to symptoms on tobacco and tomato and in details of symptom expression on potato. The Scottish disease and the form originally described from North America [cf. 4, p. 55] appear to be very close, and the differences may be due only to the use of dissimilar host plant varieties. The Scottish virus differs from Maine witches' broom [31, p. 332] in the effect produced on *N. glutinosa*. Witches' broom plants resemble wildings only

in that both have simplified leaves and many stems (an inconstant feature in Scottish witches' broom). The marginal yellowing characteristic of brooming does not occur in wildings.

Thurston (H. D.) & Eide (C. J.). **The survival of races of Phytophthora infestans in a mixture.**—Abs. in *Phytopathology*, 43, 9, p. 486, 1953.

Further tests are reported [from Minnesota Agricultural Experiment Station] with a mixture of sporangia of two isolates of *Phytophthora infestans* differentiable by their pathogenicity to the Cobbler and Cherokee potato varieties [*R.A.M.* 32, p. 395]. The ratios of the Cobbler (or field) isolate to that from Cherokee after each of nine transfers to Cobbler were 3:1, 3:1, 2·4:1, 11:1, 12:1, 6:1, 14:1, 37:1 and 90:1. The Cobbler isolate alone has been transferred to its own host for ten successive generations, and the Cherokee isolate alone to both varieties separately for six with no apparent change in virulence. These results demonstrate a lack of survival ability in the Cherokee isolate as compared with that from Cobbler [loc. cit.] and indicate that physiologic races of the fungus may exist in such minute proportions as to be overlooked until a selective variety is grown over a considerable area.

Ext (W.). **Krautfäulebekämpfung 1953.** [Blight control 1953.]—*Gesunde Pflanzen*, 5, pp. 217–218, 1953. [Abs. in *Z. PflKrankh.*, 60, 12, pp. 614–615, 1953.]

From the results of experiments on potato blight (*Phytophthora infestans*) in Germany [cf. *R.A.M.*, 33, p. 499] in 1953 it is concluded that spraying prolongs the interval between the onset of infection and death of the foliage by an average of 16 days, during which period the tubers gain in weight and starch accumulates. The first treatment should be given as soon as the plants make contact in the rows and the second and third at two- to three-weekly intervals thereafter.

In Schleswig-Holstein, according to v. Zitzewitz, infection nearly always develops after the flowering period, and the forecast by the provincial meteorological office giving 6th June, 1953, as the critical date for an outbreak was fully realized.

Hyre (R. A.). **Progress in forecasting late blight of Potato and Tomato.**—*Plant Dis. Reptr*, 38, 4, pp. 245–253, 1 diag., 6 graphs, 1954. [Multilithed.]

A description is given of a modification of Cook's method [*R.A.M.*, 29, p. 115] of forecasting potato and tomato blight (*Phytophthora infestans*) [33, pp. 375, 553], based on the analysis of rainfall and temperature data by means of moving graphs. Rainfall is plotted on a ten-day moving graph and temperature on a seven-day. On these graphs each point represents the total rainfall or average temperature for the period ending on that day. From a comparison of forecasts made from Connecticut data for the period 29th May to 31st August each year from 1902 to 1953 the most accurate predictions followed from taking as the critical period ten consecutive favourable days when the temperature did not exceed 77° F. and the total rainfall equalled or exceeded the ten-day average. With this criterion Connecticut forecasts would have been 83 per cent. correct for the 52-year period and blight would have been predicted in every year when it actually did occur. Potato blight at Ithaca, New York, in 1928, attributed to cool nights with heavy dew, and tomato blight on the west coast of Florida in 1945–6 [27, p. 49] would have been predicted successfully. The results suggest that the moving temperature-rainfall method may be adapted successfully to an extensive range of climatic conditions.

Malenev (F. E.). Влияние микроелементов на урожай и устойчивость Картофеля к болезням. [The effect of micro-elements on the yield and resistance of Potato to diseases.]—Земледелие [*Zemledelie, Moscow*], 2, 2, pp. 63–65, 1954.

In field trials at Leningrad Agricultural Institute, U.S.S.R., the treatment of

Berlihingen potato tubers or foliage or the soil with salts of manganese, boron, and copper, particularly the last, reduced infection of the plants by *Phytophthora* [*infestans*: *R.A.M.*, 33, p. 685]. Copper and boron also reduced infection by [unspecified] bacterial diseases and black scurf [*Corticium solani*: 32, p. 692]. The greatest disease reduction resulted from treating the tubers before planting with a solution containing the salt or adding the dry salt to the soil.

Thijn (G. A.). **Potato varieties and powdery mildew attacks.**—*Euphytica*, 1, 2, pp. 84–86, 1952. [Dutch summary.]

Studies at the Potato Breeding Station of the Foundation for Plant Breeding, Emmeloord, Holland, indicated that both in the field and in the greenhouse potatoes descended from parents owing their *Phytophthora infestans* resistance to *Solanum demissum* are highly susceptible to powdery mildew (*Erysiphe* ? *cichoracearum*) [*R.A.M.*, 31, p. 139]. Powdery mildew is common in the greenhouse in Holland but was not noticed in the field until 1950, when a slight attack occurred. In September, 1951, however, the disease was conspicuous on plots at the Breeding Station, and this fact may necessitate breeding for resistance to both diseases.

Niederhauser (J. S.). **Synchytrium endobioticum on wild Potatoes in Mexico.**—Abs. in *Phytopathology*, 43, 9, p. 480, 1953.

Synchytrium endobioticum has been collected at three places in central Mexico [C.M.I. map No. 1] on *Solanum stoloniferum*, *S. vallis-mexici*, and *S.* sp. The possibility that infection was contracted from introduced potatoes is very remote in at least two of the localities, suggesting that the fungus is endemic in the western hemisphere. The susceptible Up-to-Date variety reacted negatively to inoculation tests with the Mexican material.

Ontsmetting van Pootaardappelen tegen de Rhizoctonia-ziekte. [Disinfection of seed Potatoes against *Rhizoctonia* disease.]—*Vlugschr. pl-ziekt. Dienst, Wageningen*, 41, 5 pp., 5 figs., 1954.

The symptoms of *Rhizoctonia* disease of potatoes (*Corticium vagum*) [*C. solani*] are described in popular terms and directions given for its control [cf. *R.A.M.*, 33, p. 556] by immersion of the 'seed' in one of the fungicides recognized by the Dutch Phytopathological Service, namely, aardisan, aretan, and the potato disinfectants Brabant, farming, duphar, and tubosan, with indications of the various combinations of time and concentration to be employed.

Carpenter (J. B.). **Moldy rot of the Hevea Rubbertree in Costa Rica.**—*Plant Dis. Reptr*, 38, 5, pp. 334–337, 1954. [Multilithed.]

Until further investigations are made, W. W. Diehl considers it best to refer the mouldy rot fungus isolated from *Hevea* rubber in Costa Rica to *Ceratostomella* sp. rather than to *C.* [*Ceratocystis*] *fimbriata* [C.M.I. map No. 91].

Three distinct species or strains of *Ceratostomella* commonly occur saprophytically on freshly cut or broken wood and less frequently on older dead wood. Their importance as sources of inoculum for infection of the tapping panel has not been established, but since the disease occurs only sporadically some reservoir of inoculum must exist. A drosophilid fly, *Chymomyza bicoloripes*, associated constantly with mouldy rot lesions on the tapping panels and with the saprophytic colonies, may be concerned in the spread of the disease. Regular treatment with coal-tar paint on the day following each tapping gave good control over a six months' period from June to November [cf. *R.A.M.*, 33, p. 258].

Rose (R. E.) & Miller (Jean G.). **Some sampling variations in soil fungal numbers.**—*J. gen. Microbiol.*, 10, 1, pp. 1–10, 1954.

Counts of fungi by the direct plate method with soil samples taken from the same

field have frequently shown marked variations for some New Zealand pastures. The main source of error of mean counts is the variation between cores in the field, secondary factors being subsampling and plating methods in the laboratory. A sampling scheme for measuring with accuracy the mean value for a field and hence the differences in numbers of fungi between undeveloped land and high producing pastures was developed co-operatively by the Rukuhia Soil Research Station, Hamilton, and the Department of Agriculture, Wellington. It involves taking at least 20 cores from each field even if they appear homogeneous, increasing the number to 32, preferably in eight groups of four, if the cores are to be bulked before plating. Dilutions of 1:10, 1:200, and 1:20,000 are then shaken for 5 minutes. Little advantage accrues from taking more than three plates per sample. Wide variations occasionally occurred between batches on the mechanical shaker, but this could not be attributed to the effect of time of shaking.

The mean values of counts for the same soils at different samplings indicate that seasonal and even diurnal changes may be relatively large and may have to be considered in sampling schemes. The ultimate aim of these investigations is to trace the changes in soil microflora associated with treatments which change the production level.

STEVENSON (I. L.). **Antibiotic production by actinomycetes in soil demonstrated by morphological changes induced in Helminthosporium sativum.**—*Nature, Lond.*, 174, 4430, pp. 598–599, 1954.

In studies partly at the Soil Microbiology Department, Rothamsted Experimental Station, Harpenden, and at the Division of Bacteriology, Department of Agriculture, Ottawa, several soil actinomycetes, selected for their antibiotic activity towards *Helminthosporium sativum* [*R.A.M.*, 33, p. 474 and above, p. 744] and ability to reduce root rot of wheat, were examined *in vitro* for any effect on the spores and mycelium of the fungus. The former either failed to germinate or were inhibited at a point just short of germination. Hyphal changes ranged from the checking of further development to stunting, distortion, or the formation of protuberances. The use of Chinn's slide-burial technique [33, p. 627] gave similar results but in neither case could antibiotics be extracted from the soil.

Both in Petri dish culture and in sterile soil *Actinomyces antibioticus* and actinomycin [27, p. 203], the substance it produces, induced characteristic malformations in the hyphae of *H. sativum*, but again no specific antibiotic was obtained from soil containing *A. antibioticus*. This strongly suggests a localized antagonism due to a relatively high antibiotic concentration in the immediate vicinity of the actinomycetes.

RICHARDSON (L. T.). **The persistence of thiram in soil and its relationship to the microbiological balance and damping-off control.**—*Canad. J. Bot.*, 32, 2, pp. 335–346, 2 pl., 12 graphs, 1954.

The following method for determining the thiram content of treated soil was developed in the Science Service Laboratory, London, Ontario. The soil samples received 50 p.p.m. pure thiram (in the form of arasan), the usual plating procedure being adopted for analysing the microbial population. Five gm. of air-dried soil were extracted with 5 ml. 95 per cent. ethanol for one hour or longer, three 1:1 serial dilutions in ethanol then being prepared. Blotting-paper disks were saturated with each of the test solutions, uniformly drained on sterile filter paper, and transferred to solidified peptone agar seeded with spores of *Glomerella cingulata* at a density of about 200,000 per ml. agar [*R.A.M.*, 30, p. 279]. After incubation for 24 hours at 28° C. the diameters of the inhibition zones were measured and the thiram concentrations determined by comparison with standard dosage-response

curves. Samples of similar soils treated with ferbam and nabam at 50, 100, and 200 p.p.m. were also assayed.

Both thiram and ferbam progressively reduced the number of fungi. Their action appeared to be selective since *Penicillium* and *Trichoderma* spp. predominated in the treated soils [33, pp. 49, 179]. Nabam practically eliminated all the soil fungi throughout the test period. Thiram and ferbam caused a progressive increase in the bacterial counts but nabam caused an immediate reduction followed by an increase except where applied at 200 p.p.m. The treatments had no obvious effect on the numbers of actinomycetes apart from a slight reduction in the case of nabam. Thiram persisted in sandy soil for over two months but disappeared from compost within a week. Thiram treatment rendered soil more difficult to infest artificially with *Pythium ultimum* (which tolerated only up to 6·2 p.p.m. thiram) and also (at 20 p.p.m.) prevented a natural increase in the population of [unspecified] organisms causing damping-off of peas as a result of repeated cropping. This protection for seedlings persisted longer than did the fungicide in the soil.

Warington (Katherine). **The influence of iron supply on toxic effects of manganese, molybdenum and vanadium on Soybean, Peas and Flax.**—*Ann. appl. Biol.*, 41, 1, pp. 1–22, 2 pl., 4 graphs, 1954.

In experiments conducted at Rothamsted Experimental Station, the addition of 2·5 p.p.m. of vanadium failed to counteract induced iron chlorosis (iron deficiency or excess manganese) in Liral Prince flax plants, Swedish 201–14–18 soy-beans, or Kelvedon Wonder peas growing in nutrient solution, and it proved toxic. Reduction of the standard iron supply increased vanadium toxicity in soy-bean and flax, but phosphorus reduction did not. Toxicity to peas, however, was increased when the phosphorus was reduced to one-tenth, provided the iron level was not below 20 p.p.m.

Increasing the iron supply to 20 or 30 p.p.m. counteracted the toxicity of manganese (10 p.p.m.), molybdenum (40 p.p.m.), and vanadium (2·5 p.p.m.), but the effect was less apparent when the last three elements were combined. Small, successive doses of iron were less effective than larger, fewer amounts in overcoming molybdenum or vanadium (but not manganese) excess. Increased iron reduced the manganese and vanadium contents of the shoot; the molybdenum content was reduced only when iron was given in non-toxic concentrations (0·1 p.p.m.) combined with excess manganese.

The iron content of the shoot was little affected by the amount of iron supplied, but was generally reduced by high concentrations of the other three elements. Yield data for soy-bean and flax indicated an interaction between manganese and both molybdenum and vanadium when iron was low, but none between molybdenum and vanadium. The effect of all three was additive with respect to iron.

That so many factors affect the results with chlorosis-inducing elements increases the complexity of the problem. Special caution would appear to be necessary in the use of such terms as 'threshold of toxicity' without due qualification.

Kljajić (R.). Прилог проучавању паразитне флоре на лековитом биљу у току 1952 године. [Contribution to the study of the parasitic flora of medicinal plants during 1952.]—Зборн. Радова пољоп. Фак., Београд [*Rev. Res. Fac. Agric., Beograd*], 1, 2, pp. 185–200, 9 figs., 1953. [English summary.]

In 1952 a survey of the parasitic flora of medicinal plants was carried out in various parts of Serbia, Yugoslavia, particularly the region at the foot of Mt. Željin, the Pharmaceutical Garden at Beograd, and the Experimental Station 'Biljana' at Andrijaševci. Investigations on these findings were conducted at the Institute of Phytopathology, Agricultural College, Zemun. *Atropa belladonna*

mosaic virus [cf. *R.A.M.*, 23, p. 438] was the most serious virus disease, infecting over 80 per cent. of the leaves at the Pharmaceutical Garden, where all the *A. belladonna* plantings had to be removed as a result. *Septoria digitalis* [cf. 33, p. 502] was serious on *Digitalis ambigua* and *D. lanata*, with 70 per cent. infection of the leaves in the Pharmaceutical Garden, and on *D. ferruginea*, with 90 per cent infection on an area of 10 acres at Andrijaševci, some of the leaves on the ground having up to 150 blotches per leaf.

Septoria colchici affected up to 60 per cent. of *Colchicum autumnale* leaves, producing irregular, elliptical or elongated, dark spots (4 to 9 or up to 15 per leaf), which coalesced to give large necrotic areas.

Septoria rubi was very widespread on blackberry [cf. 23, p. 136]. *Alternaria daturae* caused severe damage (necrosis of the entire leaf area) to *Datura stramonium* and *A.* sp. to *Saponaria officinalis* and *Gentiana lutea*. *G. lutea* was also attacked by *Sclerotinia libertiana* [*S. sclerotiorum*] near Željin, 50 per cent. of its leaves drying up.

Fusarium herbarum [*F. avenaceum*], one of the most dangerous parasites at the Pharmaceutical Garden, destroyed over 40 per cent. of *Saponaria officinalis* plants.

Endo (C.). **A ferrugem do Girassol (Helianthus annuus, L.).** [Rust of Sunflower (*Helianthus annuus* L.).]—*Biológico*, 20, 1, pp. 11–12, 1954.

Sunflower rust (*Puccinia helianthi*) [C.M.I. map No. 195] is recorded for the first time from São Paulo, Brazil, with notes on the disease. Its economic importance is negligible at present under local conditions.

Foucart (G.). **Observations sur quelques maladies mycologiques du Pyrèthre (Chrysanthemum cinerariifolium (Trev.) Bocc.).** [Observations on some fungus diseases of Pyrethrum (*Chrysanthemum cinerariifolium* (Trev.) Bocc.).]—*Bull. agric. Congo belge*, 45, 3, pp. 599–614, 4 pl., 1954. [Flemish summary.]

In studies at the Agricultural Research Station, Mulungu, Belgian Congo, 14 different fungi were isolated from pyrethrum plants (*Chrysanthemum cinerariifolium*) [*R.A.M.*, 33, p. 413]. Experimental inoculations with *Fusarium javanicum* [cf. 26, p. 548; 33, p. 140] indicated that the fungus is definitely pathogenic only to seedlings, inducing a rapid wilt. The disease is rather prevalent in moist, acid soils (29 to 37 per cent. humidity by weight, pH 5 to 5·4).

Sclerotium rolfsii [cf. 14, p. 743] causes canker-like lesions at soil-level, with a brown to black discoloration which may spread to the point of insertion of the first leaves. A general yellowing is followed by rapid drying of the affected parts. The roots are blackish and brittle. Experimental inoculations demonstrated that young plants may be killed seven to eight days after the fungus has become established. On old plants infection is slow and frequently only partial, but when complete may cause death in one to three months.

In plants attacked by *Sclerotinia sclerotiorum* [cf. 26, p. 233; 32, p. 117; 33, p. 140] the extremities of the leaves turn yellow, then brown, and finally the entire foliage dries up. Infection is favoured by defective cultural methods and eelworm attack. *S. minor* [loc. cit.] was also frequently present as a primary pathogen.

Leaf infection by *Ramularia bellunensis* [33, p. 413] is less common on young plants than on those aged two to three years. Field inoculation experiments showed that infection of plants two to three months old occurs only when they are too crowded; attack always begins at the base of the plants. On potato dextrose agar the conidia germinate in 48 to 72 hours, and in distilled water in six to 12. Growth is usually more rapid in liquid than on solid media. Cultures kept in darkness grow more rapidly and abundantly than those in the light. Germination appears to occur most readily at temperatures between 10° and 20° C. Control measures suggested comprise establishing plantings in airy, properly drained situations, with normal

spacing and sanitary precautions [31, p. 423]; regular renewal of the plantings, with eventual fallows; and fertilizer applications. Spraying should aim at covering the whole plant, especially the base of the crown. A study should be made of the best times at which to apply the sprays. Clones 1353, 81×277/160, 2980, and 2970 and their hybrids display good resistance. Clones are required which have an open habit and flower between May and August, when infection is not severe.

Wilson (M.) & Bisby (G. R.). **List of British Uredinales.**—*Trans. Brit. mycol. Soc.*, 37, 1, pp. 61–86, 1954.

Of the 323 numbered entries in this alphabetical list taken from the literature, only 271 (including three varieties) are considered to represent good British members of Uredinales [cf. *R.A.M.*, 28, p. 595]. There is an index to synonyms and other names entered and a host index.

Kühner (R.) & Romagnesi (H.). **Flore analytique des champignons supérieurs (Agarics, Bolets, Chanterelles).** [Analytical flora of the higher fungi (Agarics, Boleti, Chanterelles.]—xiv+558 pp., 677 figs., Paris, Masson et Cie., 1953. [Received 1954.] Fr. 7,010 or 7,970 (boards).

This monumental work, the most important on the subject for 80 years, covers the species of western and central Europe, as well as most of those recorded from Algeria and Morocco, and is a series of descriptive keys, based largely on personal observations and experience, for some 2,000 species and 300 varieties (of which 80 are new). The modern system of nomenclature adopted by the authors has wide generic concepts, based on the Friesian subgenera of 1836–38, though the subdivisions of genera are for the most part new and frequently based on little-used characters. An appendix includes notes on fungal poisons and microchemical techniques, a glossary of terms, a table correlating the colour terminology of Saccardo, Klincksieck *et al.*, and Séguy, and additional notes on some species. The authors openly reject some of the International Rules and none of the new species is validly published.

Resplandy (Mme R.), Chevaugeon (J.), Delassus (M.), & Luc (M.). **Première liste annoteé de champignons parasites de plantes cultivées en Côte d'Ivoire.** [First annotated list of parasitic fungi of cultivated plants in the Ivory Coast.] —*Ann. Inst. Rech. agron.*, Ser. C (*Ann. Épiphyt.*), 5, 1, pp. 1–61, 48 figs., 1954.

This list of parasitic fungi found on cultivated crops in the Ivory Coast, stated to be the first compilation of the kind for this area, has been drawn up by workers at the Laboratory of Plant Pathology, Institute of Tropical Teaching and Research, Abidjan, Ivory Coast. It lists (under the botanical names of the hosts in alphabetical order) 325 fungi belonging to 198 species, of which about 145 are reported from the Ivory Coast for the first time. This list is followed by notes on the most interesting of the fungi, arranged in systematic order. Mention may be made of the following records.

Locally, most of the damage to cacao pods is caused by *Trachysphaera fructigena* [C.M.I. map No. 249]. If attacked when young, the pods abort; damage to older pods is less serious. On coffee cherries infection causes blackening and mummification. Maize rust (*Puccinia polysora*) [*R.A.M.*, 33, pp. 383] caused heavy losses in 1950, 1951, and 1952, but in 1953 infection was less severe. Certain maize varieties with hard, yellow seeds, imported from the Gulf of Mexico, display satisfactory resistance. *Corticium koleroga* [C.M.I. map No. 64] occurs on coffee, cacao, *Cola nitida*, and various wild plants. *Leptoporus* [*Fomes*] *lignosus* occurs on numerous cultivated crops [*R.A.M.*, 32, p. 589; 33, pp. 217, 537], including cassava planted in new forest clearings and *Hevea* rubber.

The most dangerous parasites of cotton locally include *Ashbya* [*Nematospora*] *gossypii* [cf. 31, p. 115; 32, p. 185] and *Spermophthora gossypii* [cf. 28, p. 31]. *Leptosphaeria sacchari* [cf. 33, p. 51] is commonly present on sugar-cane; the leaf spots produced frequently bear a species of *Phyllosticta*. *Ophiobolus oryzinus* [cf. 33, p. 444] is prevalent on all varieties of rice grown in the Lower Ivory Coast. *Sphaerostilbe repens* commonly attacks cassava [cf. 8, p. 291; 18, p. 504]; an outbreak on this host at Adiopodoumé was arrested by draining the soil and burning the affected plants.

Gibberella fujikuroi [33, p. 535] is common in its imperfect state on rice seed, cacao pods, coffee cherries, and ears of maize and millet. It also causes rice 'giantism' [26, p. 466; 29, p. 475]. In the region of the lagoons the symptoms of this disease are seldom found and are always much less pronounced than reported elsewhere. The high and fairly constant temperature prevailing in the Lower Ivory Coast may account for the rarity of true giantism and the high mortality caused. On cacao pods conidia of the *Fusarium* state of *G. fujikuroi* and other *Fusarium* spp. cause secondary mealy rot in plants already attacked by insects or other fungi. On maize ears *G. fujikuroi* is, locally, purely saprophytic.

Perithecia of *G.* ? *fujikuroi* var. *subglutinans* [C.M.I. map No. 191] are found in abundance on *Crotalaria retusa*, especially at the base of the stems; the foliage wilts and the plant dies in a few days.

Calonectria rigidiuscula occurs on cacao branches and rotting pods [cf. *R.A.M.*, 30, p. 457] at Adiopodoumé and in every cacao-growing region in the Ivory Coast. Control should be directed against the insects causing injuries through which the fungus penetrates.

The most important parasite of pimento [chilli] locally is *Colletotrichum nigrum* [30, p. 444]; no control is practised. Bananas are affected by *Cordana musae* leaf spot [C.M.I. map No. 168], rubber by *Helminthosporium heveae* [No. 270]; *H. maydis* [*Cochliobolus heterostrophus*; cf. *R.A.M.*, 32, p. 90] was the most serious parasite of maize in 1953, affected stools withering up rapidly. *H. torulosum* [C.M.I. map No. 175] is rare locally on green banana fruits. *Cercospora coffeicola* is very prevalent on coffee leaves [No. 59; *R.A.M.*, 33, p. 537] and very occasionally is found on coffee cherries; insufficient shade in the plantations appears to favour the disease. *F.* [*bulbigenum* var.] *lycopersici* is serious on tomato [cf. 32, p. 366] and chilli [cf. 26, p. 481].

F. javanicum [cf. 32, p. 624], *F. solani* and its vars. *minus* (*Hypomyces haematococcus*) [loc. cit.] and *eumartii* (*H.h.* var. *breviconus*) [cf. 31, p. 282; 33, p. 466] are common rotting agents locally of subterranean organs, infections being more prevalent in forest areas than in savannahs. The perfect states of the last two are sometimes found on debris lying on the ground. All three fungi are normally present in the soil of every cassava plantation in the Ivory Coast. Constantly present in the cankers of adult stems of *Crotalaria striata* is *H. ipomoeae*, associated with sclerotia of *Corticium rolfsii*. *H. ipomoeae* also infects cacao pods already damaged by insects, and may cause appreciable losses. *H. haematococcus* and its var. *breviconus* cause a fatal wilt of eggplant and tomato.

Among the records for the Ivory Coast may be listed *Thielaviopsis* [*Ceratocystis*] *paradoxa* [C.M.I. map No. 142] on *Ananassa sativa*, coco-nut, *Coffea abeokutae*, *C. canephora*, *C. liberica*, oil-palm (*Elaeis guineensis*), and *Musa nana*; *Cercospora personata* [No. 152] on groundnut; *C. beticola* [No. 96] on beet; *Phomopsis* [*Diaporthe*] *citri* [No. 126] on lime, grapefruit, and orange; *Alternaria solani* [No. 89], *Cladosporium fulvum* [No. 77], and *Septoria lycopersici* [No. 108] on tomato; *Piricularia oryzae* [No. 51] on rice; *Puccinia penniseti* [No. 225] on *Pennisetum purpureum* and *P. typhoides*; *Tolyposporium penicillariae* [No. 150] on *P. typhoides*; *Oospora citri-aurantii* [No. 124] on guava; and *Leveillula taurica* [No. 217] on eggplant.

Tarr (S. A. J.). **Diseases of fruit and vegetables in the Anglo-Egyptian Sudan.**—*Bull. Minist. Agric. Sudan* 8, 111 pp., 21 figs., 1952. [Received 1954.]

This useful annotated list of fruit and vegetable diseases in the Anglo-Egyptian Sudan [cf. *R.A.M.*, 26, p. 236; 33, p. 411] is preceded by an introduction and notes on cultural and plant-protection methods, crop sanitation, legislation, and resistant varieties, and is followed by two appendixes (one describing some well-known fungicidal preparations and the other recommending literature for further reading), a glossary, and indexes.

A chocolate spot of broad beans tends to be particularly severe in the south of the Northern Province, but in the north, where the crop is principally cultivated, the attacks are much milder. Although the symptoms resemble those of true chocolate spot (*Botrytis fabae*) it seems likely that the Sudan disease is of different origin, since no fungus has been isolated from the spots and frequent dusting with sulphur is ineffectual as a control measure.

The results of field observations and experimental work during the past ten years strongly suggest that a virus carried by *Bemisia gossypiperda* is the cause of curly top of haricot bean (*Phaseolus vulgaris*), the most serious disease of the crop, especially in hot weather. In parts of the Northern Province, where intensive cultivation is practised, infection may be so heavy that harvesting is not worth while.

The only disease recorded on beet is leaf spot (*Cercospora beticola*) [C.M.I. map No. 96], which is fairly common and sometimes severe in Bahr el Ghazal and Equatoria. Control may be effected by spraying with Bordeaux mixture combined with rational crop rotation.

Two leaf spots have recently been observed on lettuce, one caused by *C. longissima* [cf. *R.A.M.*, 32, p. 669] and the other by *Septoria lactucae* [cf. 30, p. 309], which impair appearance and quality.

Cotton leaf curl virus [31, p. 327; 33, p. 537] may be extremely destructive to *Hibiscus esculentus* [33, p. 411], attaining its maximum severity in the Gezira and Gash Delta. *H. cannabinus* and *H. sabdariffa* are also infected.

Rosette virus disease of groundnuts [C.M.I. map No. 49] is nowhere severe, a fact attributed to the resistance of locally grown varieties. Cassava mosaic virus is widespread and destructive because of the planting of infected cuttings.

Wilson (M.), Noble (Mary), & Gray (Elizabeth). **Gloeotinia—new genus of the Sclerotiniaceae.**—*Trans. Brit. mycol. Soc.*, 37, 1, pp. 29–32, 1954.

Gloeotinia n.gen. is erected to accommodate *G.* (*Phialea*) *temulenta* [*R.A.M.*, 25, p. 35], the agent of blind seed disease of ryegrass [*Lolium* spp.]. It differs from all the genera of the Sclerotiniaceae and from the Phialeoideae in its conidia embedded in mucilage, the non-differentiation of the stroma, and the homogeneity of the apothecium. The stroma, which is composed of septate, intertwining hyphae with slightly thickened walls, ramifying throughout the tissues of the caryopsis, does not show the degree of differentiation characteristic of the Sclerotiniaceae. The numerous, unicellular, cylindrical to allantoid, hyaline conidia develop in succession from the apices of short outgrowths of the aerial mycelium and form a slime. The apothecia differ in anatomy; they are fleshy, stalked, and cupulate but have no excipulum, being composed of uniform hyphae. The synonyms given are *Ciboria temulenta*, *Stromatinia temulenta*, *Sclerotinia secalincola*, *S. temulenta*, *Stromatinia secalincola*, *Phialea mucosa*, and *Endoconidium temulentum*.

Ainsworth (G. C.) & Cowan (S. T.). **Rules of nomenclature for fungi and bacteria.**—*J. gen. Microbiol.*, 10, 3, pp. 465–474, 1954.

Attention is drawn to certain requirements of the current International Botanical and Bacteriological Codes of Nomenclature [*R.A.M.*, 32, p. 101 and next abstract],

with particular reference to the denoting of categories, the proposal of new species, and the changing of names of fungi and bacteria.

DENNIS (R. W. G.), WAKEFIELD (E[LSIE] M.), & BISBY (G. R.). **The nomenclature of Armillaria, Hypholoma and Entoloma.**—*Trans. Brit. mycol. Soc.*, 37, 1, pp. 33–37, 1954.

Rigid application of the 'residue method' in the selection of generic lectotypes, as in the case of *Armillaria* and *Hypholoma*, has given results which appear to be contrary to the International Code of Botanical Nomenclature [see preceding abstract] and which may lead to the interpretation of classical genera in senses quite different from those originally intended. The authors support the earlier proposals that the lectotype of *Armillaria* be *Agaricus melleus* and that of *Hypholoma*, *A. sublateritius*. *Armillariella* and *Nematoloma* should then be relegated to synonymy under *Armillaria* and *Hypholoma*, respectively. The adoption of the name *Rhodophyllus* is contrary to the Code; those who recognize only one genus of polyhedral-spored Rhodosporae should use *Entoloma*.

INGOLD (C. T.). **Ascospore form.**—*Trans. Brit. mycol. Soc.*, 37, 1, pp. 19–21, 1 diag., 1954.

Studies at Birkbeck College, University of London, indicated that while in most ascomycetes the lower part of the ascospore is the mirror image of the upper, in many species the upper part is relatively broad and blunt and the lower part narrow and pointed. The reverse never seems to occur. Possible biological advantages of the asymmetrical type are discussed.

ARX (J. A. v.). **Revision einiger Gattungen der Ascomyceten.** [Revision of some genera of the Ascomycetes.]—*Acta bot. neerl.*, 3, 1, pp. 83–93, 1954. [English summary.]

Among the emendations proposed in connexion with a revision of some genera of the Ascomycetes erected by Petrak and other authors may be mentioned the substitution of *Apiosporina morbosa* (Schw.) n.comb. for *Dibotryon morbosum* [*R.A.M.*, 14, p. 772] (syn. *Sphaeria morbosa* and *Plowrightia morbosa*). In all, 20 genera are relegated to synonymy, necessitating the application of new names to the type species and some others.

MÜLLER (E.). **Kulturversuche mit Askomyzeten I.** [Cultural studies with ascomycetes I.]—*Sydowia*, 7, 5–6, pp. 325–334, 4 figs., 1953.

Cultural studies at the Federal Technical Institute, Zürich, on six Swiss species of *Leptosphaeria* [cf. *R.A.M.*, 33, p. 321] are described.

Isolated on malt agar from iris rhizomes, *L. heterospora* gave rise to pycnidia of the *Phoma* type, while the perfect state developed after overwintering in a cold greenhouse. On sterilized wheat straw pycnidial formation is inhibited but perithecia are produced in large numbers at the end of the winter. The conidia, 2 to 3 by 1 to 1·5 μ, are abstricted from the slightly clavate conidiophores, 6 to 12 by 1 μ, lining the quasi-opaque, blackish-brown walls of the spherical pycnidia, 60 to 80 μ in diameter. This form appears to be new. The identity of the fungus referred by Simmons to *L. heterospora* [32, p. 102] is regarded as questionable.

An isolate of *Gibberidea visci* from *Viscum album* produced a dark green mycelium, turning nearly black, and masses of pycnidia agreeing (except for the absence of a stroma) with *Pleurostromella visci* Petrak (*Ann. mycol., Berl.*, 23, pp. 61–62, 110–111, 1925).

CUNNINGHAM (G. H.). **Hyphal systems as aids in identification of species and genera of the Polyporaceae.**—*Trans. Brit. mycol. Soc.*, 37, 1, pp. 44–50, 1954.

The author demonstrates from studies at the Plant Diseases Division, Auckland,

New Zealand, the way in which hyphal systems in the Polyporaceae may be used as aids to generic delimitation [cf. *R.A.M.*, 31, p. 508]. Species often placed under *Fomes* [28, p. 361] differ so profoundly in micro-structure that they might be put in five different genera, namely, *Fomes*, *Elfvingiella*, *Ganoderma*, *Fomitopsis*, and *Elfvingia*. By means of micro-features the author defines and keys out the above genera and *Polyporus*, *Irpex*, *Coriolus*, *Lenzites*, *Coltricia*, *Inonotus*, *Hapalopilus*, *Amauroderma*, *Trametes*, and *Daedalea*. *Polystictus* is claimed to be a synonym of *Coltricia*. Variable forms of difficult species such as '*Polyporus schweinitzii*', '*P. ochroleucus*', and '*P. occidentalis*' may be accurately identified by their micro-structure as belonging to *Coltricia*, *Fomitopsis*, and *Coriolus*, respectively.

Simmons (E. G.). **Culture studies in the genera Pleospora, Clathrospora, and Leptosphaeria. II.**—*Mycologia*, 46, 2, pp. 184–200, 1954.

Further studies in this series [*R.A.M.*, 32, p. 102] indicated that *Pleospora njegusensis* is a strain of *Clathrospora diplospora* with 'normal'-sized spores. This strain and one with 'large' spores [loc. cit.] are two distinct species of *Clathrospora*.

For the production of mature perithecia by different strains of *P.* and *C.* it is necessary to allow a certain period (depending on the species) at room temperature (22° to 26° C.) during initial growth followed by a low temperature (5°) for maturation of the perithecia. The total growth time varied from 16 to 36 weeks for the different species.

The number of mature perithecia produced by individual isolates on Leonian's agar was frequently characteristic for a species. The cultural characters of separate isolates of single species often differed.

Altogether six collections, representing five species, were studied. Measurements of the perithecial states are given and the ascospore lengths are analysed statistically.

Maxwell (Mary B.). **Studies of Canadian Thelephoraceae XI. Conidium production in the Thelephoraceae.**—*Canad. J. Bot.*, 32, 1, pp. 259–280, 2 pl., 54 figs., 14 diags., 1954.

The development of secondary reproductive bodies in culture by certain hymenomycetes suggests that their propagation in nature by this method may be more important than has been recognized hitherto. In the present studies at the Department of Agriculture, Ottawa, four Canadian species of the Thelephoraceae [cf. *R.A.M.*, 33, p. 634], namely, *Stereum sulcatum* from spruce (*Picea glauca*), *Abies* sp., and *A. lasiocarpa*, *Vararia granulosa* from *P. glauca* and *Abies* sp., *Corticium furfuraceum* from *Pinus strobus*, and *Trechispora raduloides* from a variety of trees, were found to produce conidia on both haploid and dikaryotic mycelia. The conidia of the first three species were borne on oedocephaloid conidiophores while those of the fourth were formed sympodially. In all the species the conidia, however formed, were uninucleate and each germinated to give a haploid mycelium. *S. sulcatum* and *V. granulosa* both exhibited a bipolar type of interfertility. For each of the four species complete interfertility was obtained in pairings between monoconidial cultures from different isolates of the same species. A series of monoconidial cultures for each species, derived from conidia borne on a dikaryotic mycelium, when paired in all possible combinations, fell into two groups on the basis of their ability to produce clamp connexions. In *S. sulcatum* members of each group were interfertile with one or another of the two types of single basidiospore culture from the same isolate.

There appeared to be no fusion of nuclei prior to conidium formation on the dikaryotic mycelium.

Loos (C. A.). **A note on spraying and dusting against blister blight.**—*Tea Quart.*, 24, 4, p. 97, 1953. [Received June, 1954.]

A communication from Universal Crop Protection, Ltd., to the Tea Research Institute, Ceylon, states that under the weather conditions prevailing during the 1952 Ury Group experiment [*R.A.M.*, 33, p. 186] some estates in the Uva district were protected adequately against blister blight [*Exobasidium vexans*] on tea in plucking by 5 to 6 lb. 4 per cent. cuprosana dust applied every 8 to 10 days, one application being required between pluckings. It has also been brought to the notice of the Institute that under the same conditions 2 to 3 oz. (instead of the recommended 4 oz.) wettable 50 per cent. copper proprietary formulations in 10 gals. water also gave adequate protection. Recent developments in spray applications have reduced spraying costs from between Rs. 2.75 and Rs. 3 at the time of the Ury experiment to about Rs. 1.70 per acre at the present time. With the use of the 'Hobson' boom it is hoped to reduce this figure still further.

It is emphasized that the amounts of dusts and sprays recommended are the maximum for adequate protection under all possible weather conditions. The decision to use smaller amounts rests with local managements.

Portsmouth (G. B.). **Potash deficiency in Tea.**—*Tea Quart.*, 24, 4, pp. 79–81, 3 col. pl., 1953. [Received June, 1954.]

At the end of the seventh cycle of the St. Coombs manurial experiments (1949 to 1952) it was estimated that there was a return of 6·9 lb. made tea for each lb. potassium supplied, as against 2·8 lb. for each lb. nitrogen. The yield reduction from lack of potash amounted to 25 per cent. of the crop.

Bushes deprived of potash for over 22 years [cf. *R.A.M.*, 20, p. 383] bear only a few leaves at the top of each branch, have thin, twiggy wood, and hardly any new flush growth. Many leaves have pronounced marginal scorch. Stands were thin as many bushes had died. Dry weight analyses demonstrated the potash content of new and old leaf samples from potash-deficient plots to be one half and one third, respectively, that of leaves from adequately fertilized bushes.

Keener (P. D.). **Tobacco mosaic virus in Datura meteloides DC. and Nicotiana glauca Graham in Arizona.**—*Plant Dis. Reptr*, 38, 5, pp. 330–332, 3 figs., 1954. [Multilithed.]

A strain of tobacco mosaic virus was identified as the cause of a yellow mottle in wild plants of *Datura meteloides* and *Nicotiana glauca* in Arizona. The fact that some infected plants were found in localities infrequently visited by man points to the existence of some unrecognized vector [cf. *R.A.M.*, 33, p. 565].

Adsuar (J.), Amy (A. S.), & López Matos (L.). **The effects of the mottle and the common Tobacco mosaic viruses on the yield of variety Virginia 12.**—*J. Agric. Univ. P.R.*, 38, 2, pp. 105–107, 1954. [Spanish summary.]

In a field experiment at the Tobacco Substation, Caquas, Puerto Rico, the variety Virginia 12, inoculated by rubbing with tobacco mottle virus [*R.A.M.*, 20, p. 601] and tobacco mosaic virus [loc. cit.], the most important tobacco diseases on the island, yielded 6·15 and 6·16 cwt. per acre, respectively, and the uninoculated plants 9·54 cwt. The difference of about 3·4 cwt. is equivalent to approximately $114 per acre. Mosaic damage may be mitigated to some extent by the use of resistant varieties but there appears to be no source of resistance to mottle at present.

Price (W. C.). **Genetic composition in relation to isoelectric point and serological reactions of strains in Tobacco mosaic virus.**—*Trans. N.Y. Acad. Sci.*, Ser. II, 16, 4, pp. 196–201, 1 diag., 1954.

Nearly all the 14 papers on which the author bases this survey of the available

information on various aspects of the problem of mutation in tobacco mosaic virus have already been noticed in this *Review* [*R.A.M.*, 33, p. 121 *et passim*].

Kleczkowski (A.). **Stability of chymotrypsin and Tobacco mosaic virus decreased by ultraviolet radiation.**—*Biochem. J.*, 56, 2, pp. 345–349, 1954.

It was demonstrated at Rothamsted Experimental Station that the increased rate at which tobacco mosaic virus is denatured on heating for 30 minutes at 69° C. after ultra-violet irradiation [*R.A.M.*, 33, pp. 54, 585] results from a series of changes following a step associated with the loss of infectivity. Chymotrypsin molecules can be altered by irradiation so that their stability at temperatures round 37° is decreased, though they remain proteolytically active.

Quantum yields for inactivation of the enzyme and the virus computed from the data obtained in this study agree with those reported previously (McLaren, A. D. & Fingelstein, P.).—*J. Amer. chem. Soc.*, 42, 5423, 1950).

Watson (J. D.). **The structure of Tobacco mosaic virus. I. X-ray evidence of a helical arrangement of sub-units around the longitudinal axis.**—*Biochim. biophys. Acta*, 13, 1, pp. 10–19, 4 figs., 1 diag., 1954. [French and German summaries.]

On the basis of X-ray diffraction evidence it is suggested that the tobacco mosaic virus particle contains a large number of equivalent sub-units disposed in a helical pattern about the longitudinal axis.

Delwiche (C. C.), Newmark (P.), & Takahashi (W. N.). **Relationship between Tobacco mosaic virus and a protein accompanying Tobacco mosaic virus infection.**—Abs. in *Fed. Proc.*, 13, 1, pp. 197–198, 1954.

In joint experiments at the Departments of Plant Biochemistry and Plant Pathology and the Virus Laboratory, University of California, Berkeley, an abnormal protein accompanying tobacco mosaic virus infection, 'protein X' or 'component B' [*R.A.M.*, 32, p. 593; 33, p. 265], was synthesized rapidly in the diseased leaf from fractions of low molecular weight, such as amino acids, and not by rearrangement or condensation of previously existing normal proteins. The virus and 'protein X' fractions formed during given periods contained comparable levels of N^{15} and were apparently derived from sources with identical isotope contents. The isotope content of the total 'protein X' isolated at the end of any period was always different from that of any possible protein precursor of the new tobacco mosaic virus formed during the same time. 'Protein X', therefore, is not a typical sample of virus precursor.

Schneider (I. R.). **The effect of purines, purine analogs and related compounds on the multiplication of Tobacco mosaic virus.**—*Phytopathology*, 44, 5, pp. 243–247, 1 graph, 1954.

At the Department of Plant Pathology, University of California, Berkeley, the most effective of the purines, their analogues, and related compounds tested for the inhibition of tobacco mosaic virus multiplication in tobacco leaf disk culture [*R.A.M.*, 32, p. 515] were 8-azaguanine, 8-azaadenine, 2-azaadenine, and 2,6-diaminopurine [cf. 33, p. 67]. A significant measure of inhibition was also obtained in tests with benzimidazole and its 6-nitro- and 2-ethyl-5-methyl- derivatives, thioguanine, 2-methylthioadenine, and 2-iodoadenine.

Adenine completely reversed the inhibition of the virus by either 8-azaadenine or 2,6-diaminopurine, while adenosine and adenylic acid were highly, and guanine appreciably active in the same direction [31, p. 318].

Bőszőrményi (Z.) & Szabó (E.). **Az 'ermenti nekrózis' vírusbetegség hatása a Dohány vízforgalmára.** [The effect of the Tobacco streak virus disease on the

water economy of the Tobacco plant.]—*Ann. Biol. Univ. Hung.*, 2, 2, pp. 201–210, 2 graphs, 1954. [English and Russian summaries.]

Transpiration of tobacco leaves infected by streak virus disease [cf. *R.A.M.*, 19, p. 307; 32, p. 39; and below], the most widely distributed disease of the plant in Hungary, was less than that of healthy ones, the upper leaves particularly giving low values. There was a gradient of water loss, which was at a minimum in leaves on the upper third of the stem. Dry weight increased towards the upper leaves and the percentage water content was higher in infected plants.

Razvyazkina (Mme G. M.). Значение Табачного трипса в развитии эпифитотий верхушечного хлороза Махорки. [The importance of Tobacco thrips in the development of epiphytotics of Mahorka tip chlorosis.]—Докл. Акад. сельскохоз. Наук Ленина [*Rep. Lenin Acad. agric. Sci.* = *Proc. Lenin Acad. agric. Sci.*], 18, 6, pp. 27–31, 1953. [Received September, 1954.]

Investigations at the Moscow Plant Protection Station, U.S.S.R., have shown that tobacco thrips [*Thrips tabaci*], the vectors of a tip chlorosis of tobacco and mahorka [cheap tobacco], a disease related to the tomato bronze disease [tomato spotted wilt virus: *R.A.M.*, 30, p. 348], are the chief source of virus infection. The virus overwinters in the body of the insect, which becomes infected in the larval stage and can then transmit the virus within three days. The minimum time required for the plants to become infected is five minutes and for the thrips to feed on infected plants 30 minutes. The virus is not egg-transmitted.

Mandryk (M.). **Suppression of rooting of Tobacco cuttings by yellow dwarf virus.**—*J. Aust. Inst. agric. Sci.*, 20, 1, pp. 50–51, 1954.

In work at the Division of Plant Industry, Canberra, 561 cuttings with and without leaves from 32 tobacco plants infected with yellow [leaf] dwarf virus [*R.A.M.*, 32, p. 237] and 151 from eight healthy plants were grown in a propagation chamber for 28 days after about half of each lot had been treated with indolebutyric acid. The main single factor influencing rooting was the presence or absence of leaves: leafless cuttings, whether healthy or infected, produced very few or no roots. Virus infection reduced the number of rooted cuttings by approximately 50 per cent. Treatment with indolebutyric acid did not give any increase in the percentage of rooted cuttings, but augmented the average number of roots and their vigour.

Cured leaves from yellow leaf dwarf plants are high in carbohydrates and low in nitrogen. The effect of the virus on plant constituents is considered to be the major factor affecting rooting.

Senseney (C. A.), Kahn (R. P.), & Desjardins (P. R.). **Particle size and shape of purified Tomato-ringspot virus.**—*Science*, 120, 3116, pp. 456–457, 1 fig., 1954.

Purified preparations of Price's tomato ring spot virus [*R.A.M.*, 19, p. 668; 31, p. 318] in tobacco contained four- to six-sided particles 43 by 13·5 mμ, or, if assumed to be spherical, 27 mμ in diameter, together with spheroidal particles 14 mμ in diameter. The former were shown to be highly infective. The virus therefore differs from tobacco ring spot virus.

Gigante (R.). **Osservazioni sulla 'farfara' del Tabacco in provincia di Lecce.** [Observations on 'farfara' of Tobacco in the province of Lecce.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 10 (*1952*), pp. 71–108, 18 figs., 1953. [English summary.]

This paper on the 'farfara' tobacco disease complex in Italy, consisting of *Pseudomonas tabacum*, tobacco ring spot virus, and tobacco streak virus, has already been noticed from another source [*R.A.M.*, 32, p. 593].

Diachun (S.) & Troutman (J.). **Multiplication of Pseudomonas tabaci in leaves of Burley Tobacco, Nicotiana longiflora, and hybrids.**—*Phytopathology*, 44, 4, pp. 186–187, 1954.

At Kentucky Agricultural Experiment Station, Lexington, leaves of the susceptible Ky 56 Burley tobacco, the resistant *Nicotiana longiflora* and Burley 1819–9, and hybrid TL 106 were inoculated with *Pseudomonas tabacum* [*R.A.M.*, 26, p. 358] by watersoaking. The populations in the inoculated areas were determined by daily plating on potato dextrose agar for about a week. The bacteria were found to multiply in all four kinds of plants, the maximum numbers occurring in the susceptible and the minimum in the resistant, while the population in the hybrid was intermediate. The power of *P. tabacum* to multiply in resistant plants suggests the possibility of the evolution of more virulent strains.

Taylor (G. S.). **Control of Tobacco blue mold by root application of zineb and ferbam.**—Abs. in *Phytopathology*, 43, 9, p. 486, 1953.

AST shade tobacco plants sprayed with zineb (1½ lb. in 100 gals. water) and ferbam (2 lb.) were given three washings, each equivalent to 0·18 in. rain, on five days before inoculation with *Peronospora tabacina* [at Connecticut Agricultural Experiment Station: *R.A.M.*, 32, p. 614; 33, p. 642, and next abstract]. Using a scale in which 0 = no disease and 6 = severely diseased, the ratings assigned to zineb, ferbam, and untreated were 1·3, 3, and 4·3, respectively. The results suggested a chemotherapeutic action for zineb from the wash water. To verify this hypothesis, zineb and ferbam (200 p.p.m.) were applied to the roots of three groups of plants grown in sand in amounts of 50 ml. per plant on five consecutive days ending ten days, six days, and one day, before inoculation with *P. tabacina*. After a fortnight the mean ratings for zineb, ferbam, and water, respectively, were 1·4, 2·2, and 4·2 for ten days; 1·5, 0·8, and 4·9 for six; and 1, 2, and 5·3 for one. Under some conditions, therefore, both zineb and ferbam can apparently exert a chemotherapeutic action.

Grosso (J. J.). **Control of Tobacco blue mold by antibiotics.**—*Plant Dis. Reptr*, 38, 5, p. 333, 1954. [Multilithed.]

At Beltsville, Maryland, various antibiotics (four applications of each at four-day intervals) were tested in the greenhouse for the control of tobacco blue mould (*Peronospora tabacina*) [see preceding abstract]. In one experiment a 0·01 per cent. aqueous spray of streptomycin sulphate reduced the percentage leaf destruction from 30 (untreated) to 1·8, being second only to dithane (1·7) and superior to the other antibiotics tested. In a further test the figures were: streptomycin sulphate at 0·02 and 0·01 per cent., 1·1 and 5·2, respectively; dithane (3 lb. per 100 gals.), 12·7; and the untreated, 50.

Sasser (J. N.), Powers (H. R.), & Lucas (G. B.). **The effect of root-knot nematodes (Meloidogyne spp.) on the expression of black shank resistance in Tobacco.**—Abs. in *Phytopathology*, 43, 9, p. 483, 1953.

Tobacco seedlings, resistant to black shank (*Phytophthora parasitica* var. *nicotianae*) [at the North Carolina Agricultural Experiment Station: *R.A.M.*, 33, p. 119], in pots of steamed soil were (1) left untreated, (2) inoculated with the fungus, (3) inoculated with single species of *Meloidogyne*, and (4) inoculated with both fungus and nematodes. Good growth was made by all the seedlings except those in (4), which wilted within a week, developed black shank symptoms a week later, and died within a month.

In a similar series of tests when the fungus was introduced after a month 78 per cent. of the nematode-infested plants eventually developed black shank, whereas none of those free from root knot contracted the disease.

S[TINSON] (F. A.). **So this is 'sand drown'.**—*Rhod. Tobacco, 1954*, 4, p. ii, 3 figs., 1954.

During the current season magnesium deficiency of tobacco [*R.A.M.*, 29, p. 438] was more widely recognized in Southern Rhodesia than hitherto. Studies on its control by soil amendments have been in progress for three years at the Kutsaga and Trelawney Research Board Stations. High-grade dolomite (20 per cent. magnesium oxide) is plentiful locally, and the inclusion in the fertilizer of enough to supply 20 lb. per acre suffices to avoid a shortage. Magnesium sulphate or other magnesium compounds may also be applied, usually in combination with potassium.

MILLER (P. M.). **An apparently new virus of Tomatoes in Illinois.**—Abs. in *Phytopathology*, 43, 9, p. 480, 1953.

A new tomato disease in Illinois, characterized in the field by vein-clearing, occasional foliar necrosis, and interveinal chlorosis, is attributed to a virus designated V–52–1, which resembles tobacco mosaic virus in some physical properties and the following features: under greenhouse conditions it produces systemic mottling in tomato (the only symptom) and Turkish tobacco, and necrotic local lesions in *Nicotiana glutinosa*, *Datura stramonium*, and eggplant; it gives inactivation and precipitin reaction from V–52–1 guinea-pig antiserum. On the other hand, the new virus differs from tobacco mosaic virus in the production of necrotic local lesions on large Black Eye cowpea but not on Scotia, Pinto, Early Golden Cluster, Idaho Refugee, or Great Northern beans (*Phaseolus vulgaris*); inactivation after 10 minutes at a temperature of 70° C.; and instability during storage at 2° and freezing.

SYLVESTER (E. S.). **Yellow-net virus disease of Tomato.**—*Phytopathology*, 44, 4, pp. 219–220, 1 fig., 1954.

Since 1946 a yellow-net virosis has developed sporadically in tomato plantings at Berkeley, and twice in fields at Salinas, California. The leaflets of all varieties tested, including *Lycopersicon pimpinellifolium*, exhibit marked chlorosis of the veins and veinlets, the initially vivid coloration tending to fade and disappear in a month to six weeks after its onset. The incubation period of the disease in the Marglobe variety ranged from 11 to 31 days with a mean of 19·7.

Myzus persicae (the only aphid species tested in replicated series) proved to be a relatively inefficient vector, transmitting the virus in about 17 per cent. of 217 trials with 10 individuals per plant. The transmission cycle can be completed within 72 hours, allowing periods of 24 and 48 hours for acquisition and feeding, respectively; the aphids remained infective for up to nine days.

In none of the reciprocal transmission tests did the tomato yellow-net virus infect beet or the beet yellow-net virus [*R.A.M.*, 32, pp. 3, 460] tomato, so that it is probably advisable for the present to regard them as distinct entities despite their resemblances in respect of symptoms and vector relationships.

WAGGONER (P. E.) & DIMOND (A. E.). **Reduction in water flow by mycelium in vessels.**—*Amer. J. Bot.*, 41, 8, pp. 637–640, 1 diag., 1954.

In the Department of Botany and Plant Pathology, Connecticut Agricultural Experiment Station, New Haven, the reduction of water flow by mycelium of *Fusarium oxysporum* f. [*bulbigenum* var.] *lycopersici* in wilted tomato plants [*R.A.M.*, 33, pp. 453, 691] was estimated by means of a scale model operating at the same Reynolds number (defining flow in terms of fluid density and viscosity in relation to rate of flow and vessel diameter) as that evaluated for the host. In a vessel containing ten hyphae each with a diameter 0·1 that of the vessel, liquid tension must increase six times if flow is not decreased. If tension is not increased flow will be reduced to about 17 per cent. Reduction in flow due to the physical

presence of hyphae must therefore contribute to the large decrease in flow produced by some wilt fungi but cannot be the total cause. Additional factors must be sought among the products of the fungus or its action upon the vessels.

CICCARONE (A.) & CARILLI (A.). **Prove di lotta contro Alternaria porri (Ell.) Saw. f. sp. solani (E. et M. pro sp.) Neerg. in agro di Scafati (Salerno).** [Experiments on the control of *Alternaria porri* (Ell.) Saw. f. sp. *solani* (E. et M. pro sp.) Neerg. in the field at Scafati (Salerno).]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 10 (*1952*), pp. 111–126, 3 figs., 4 graphs, 1953. [English summary.]

This paper on the control of *Alternaria solani* on tomatoes in Italy [see next abstract] has already been noticed from another source [*R.A.M.*, 32, p. 347].

ROSA (M.). **Prove di lotta chimica contro Alternaria porri (Ell.) Saw. f. sp. solani (E. et M. pro sp.) Neerg. nella piana del Sarno durante l'anno 1952.** [Experiments on the chemical control of *Alternaria porri* (Ell.) Saw. f. sp. *solani* (E. et M. pro sp.) Neerg. on the Sarno plain during the year 1952.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 10 (*1952*), pp. 177–187, 2 graphs, 1953. [English summary.]

In further spraying tests at Scafati, Italy, against natural infection by *Alternaria solani* on San Marzano commune tomatoes [see preceding abstract], 13 applications between 27th June and 23rd September, 1952, of 0·3 per cent. dithane Z-78 [cf. *R.A.M.*, 33, p. 645], 1 per cent. Bordeaux, 0·1 per cent. shirlan A.G., 0·22 per cent. captan, 0·15 per cent. phygon, and 0·4 per cent. thiram (tulisan) all significantly reduced infection, giving average numbers of spots per leaflet of 2·75, 2·955, 4·405, 5·635, 6·055, and 7·28, respectively, as compared with 11·395 for the untreated.

BEAUMONT (A.). **Tomato leaf mould : spraying trials in Lancashire and Yorkshire, 1949–52.**—*Plant Path.*, 3, 1, pp. 21–25, 1954.

To investigate the degree of control of tomato leaf mould (*Cladosporium fulvum*) [cf. *R.A.M.*, 32, p. 470; 33, pp. 388, 656] given by some of the newer fungicides, and to compare their performance with that of colloidal copper plus oil, spraying trials were carried out in Lancashire and Yorkshire from 1949 to 1952, in houses where the disease was likely to appear, on varieties other than Potentate (on which oil causes oedema). Fortnightly assessments of the progress of the disease were made by means of a key developed by the Disease Assessment Committee of the Conference of Advisory Plant Pathologists.

The results indicated that under ordinary conditions, when leaf mould infection is slight or moderate, almost any fungicide will give satisfactory control, if spraying is carried out properly and repeated with sufficient frequency. All copper fungicides appear to be about equally efficient, but colloidal copper with white oil has the advantage that it leaves no visible deposit on the fruit.

Of the non-copper fungicides, salicylanilide and zineb were outstanding; thiram, glyoxalidine, and ziram gave some control. Ziram left a heavy deposit on the fruit. Only nabam plus zinc sulphate proved effective in severe epidemics.

ORILLO (F. T.) & BOMBAY (B. B.). **Melanconium fruit rot of Tomato.**—*Philipp. Agric.*, 36, 3, pp. 114–130, 3 figs., 1952. [Received October, 1953.]

The fruit rot of tomato in the Philippines caused by *Melanconium lycopersici* [*R.A.M.*, 32, p. 457] is a serious disease attacking also the leaves, stem, and flowers in the field. *M. lycopersici* grows and sporulates abundantly on agar media. Cross-inoculation experiments showed that vegetative parts of potato, *Datura alba*, and eggplant are readily infected by the pathogen. The fungus overwinters in plant debris and is seed-transmissible. All the tomato varieties in cultivation in the Philippines are susceptible to the disease, but the native wild tomato is less so, and

occasionally even recovers. The pathogen is spread by wind- and rain-carried spores, by insects, and in transit by mixing healthy and infected fruits.

The disease is controlled by spray applications of 1 or 2 per cent. 530 spraycop or 0·3 to 2 per cent. fermate, and by plant sanitation, crop rotation, selection and disinfection of seed, and care in harvesting, packing and transporting the fruit.

MOLLENHAUER (RUTH) & SMITH (C. B.). **Tomato plant absorption and translocation of manganese and zinc from dithiocarbamate fungicide sprays.**—*Proc. Amer. Soc. hort. Sci.*, 63, pp. 297–303, 1954.

Experimental evidence was obtained at Pennsylvania Agricultural Experiment Station that Rutgers tomato plants grown in manganese-deficient culture solutions absorbed the element from manzate foliage sprays [cf. *R.A.M.*, 33, p. 680], but zinc-deficient plants did not absorb zinc from zerlate. The fact that plants sprayed with zerlate contained more iron than those treated with manzate or the controls cannot be explained. Larger quantities of iron and manganese were found in the lower leaves than in the upper.

BARNETT (H. L.) & JEWELL (F. F.). **Recovery of isolates of Endoconidiophora fagacearum from Oak trees following mixed culture inoculations.**—*Plant Dis. Reptr*, 38, 5, pp. 359–361, 1954. [Multilithed.]

In experiments in West Virginia in 1953, 70 red and black oak [*Quercus* spp.] trees, 1 to 4 in. in diameter, were inoculated with conidial suspensions of *Endoconidiophora fagacearum* [*Chalara quercina*: *R.A.M.*, 33, p. 693 and next abstract] from single dark and albino isolates [cf. 33, p. 326] or mixtures of two or four cultures. From most of the trees receiving mixed inoculum only one type of culture was recovered, relatively few trees yielding two or more, thus confirming the previous findings [33, p. 189] that one isolate usually becomes established in the tree more rapidly than, and to the exclusion of, another.

STRUCKMEYER (B. ESTHER), BECKMAN (C. H.), KUNTZ (J. E.), & RIKER (A. J.). **Plugging of vessels by tyloses and gums in wilting Oaks.**—*Phytopathology*, 44, 3, pp. 148–153, 10 figs., 1954.

Further histological studies at the University of Wisconsin on samples of 20-year-old pin oaks (*Quercus ellipsoidalis*) infected by *Chalara quercina* [*R.A.M.*, 33, p. 268] confirmed previous findings of the extensive occlusion of the xylem vessels with tyloses and gums. These arise before the development of wilt, which appears to result from water shortage rather than from a toxic substance. Tyloses were formed mainly in the large vessels of the spring wood, especially of the last annual ring. In the later stages of the disease gum was often produced in the smaller vessels, vascular rays, xylem parenchyma, tracheids, and among the tyloses of the larger vessels. There was comparatively little vascular plugging in the roots.

ROTH (E. R.) & HEPTING (G. H.). **Eradication and thinning tests for Nectria and Strumella canker control in Maryland.**—*J. For.*, 52, 4, pp. 253–256, 2 figs., 1954.

Severe cankers caused by *Nectria* spp. and *Strumella coryneoidea* [*R.A.M.*, 30, p. 395] have been observed on stands of mixed oak in the northern Allegheny Plateau, particularly in the Swallow Falls State Forest near Oakland, Maryland. Canker eradication and thinning on plots established between 1933 and 1935 proved unnecessary against *Nectria* as the period of abundant infection was past, and unsuccessful for *Strumella* over an 18-year period, indicating that the silvicultural treatment in such stands should be confined to the selection of canker-free crop trees and utilization of diseased ones.

PUBLICATIONS OF THE COMMONWEALTH MYCOLOGICAL INSTITUTE

THE REVIEW OF APPLIED MYCOLOGY

THE subscription to the *Review* for the current volume is 50*s.* per annum, post free, payable in advance. Back volumes can be supplied, but the price is 60*s.* per volume, postage extra, with the exception of Volumes I, II, and XII, which are out of print. Volumes IV, V, VI, VII, and VIII have been reprinted and are available at 70*s.* per volume. Microfilm copies of the volumes out of print can be supplied to order.

INDEX OF FUNGI (formerly SUPPLEMENTS TO THE REVIEW OF APPLIED MYCOLOGY)

AN INDEX OF FUNGI listing new species and varieties of fungi, new combinations, and new names published since the beginning of 1940 is published half-yearly. The cost of Vol. 1, Parts 1 to 20 and Vol. 2, Parts 1 to 9 (all published to the end of 1954) is 3*s.* 9*d.* each part. The subscription price is 7*s.* 6*d.* per annum.

The Cumulative Index for Volume I, comprising pp. 289–430, is now available at a price of 25*s.*, post free. Binding cases in buckram for Volume I can be obtained at a cost of 5*s.*, post free.

Complete bound volumes of Volume I with the cumulative index are also available at a price of £5. 15*s.*

INDEX OF FUNGI. PETRAK'S LISTS FOR 1920–39. The following are now available, 1936–39, price 30*s.*; 1932–35 (original copies in Just's *Botanischer Jahresbericht*), price 45*s.*; 1931, price 10*s.*; 1930, price 25*s.*; 1929, price 10*s.*; 1922–28, price 40*s.*; 1921, price 10*s.*; 1920, price 10*s.*

DISTRIBUTION MAPS OF PLANT DISEASES

A SERIES of maps showing the world distribution of major plant diseases is now being issued at the rate of two maps each month. Of the 24 maps issued each year, six may be new editions, which in future cannot be issued free. The subscription price is 7*s.* 6*d.* per annum, post free. Back issues, in series, 5*d.* each; odd numbers 9*d.* each, postage extra. Loose-leaf binders for the maps are now available, price 20*s.*, postage extra. For a list of maps 1 to 282 see *R.A.M.*, **22**, p. 48; **23**, p. 80; **24**, p. 128; **25**, p. 96; **26**, p. 32; **27**, p. 96; **28**, p. 96; **29**, p. 112; **30**, p. 176; **31**, p. 160; **32**, p. 352; **33**, p. 654.

MYCOLOGICAL PAPERS

No. 37. STUDIES ON MICRO-FUNGI. IV. Two fungi of *Betula* periderm. By S. J. HUGHES. 17 pp., 5 figs., 1950. 4*s.* 6*d.*

No. 38. STUDIES ON MICRO-FUNGI. V. *Acrotheca*. By S. J. HUGHES. 8 pp., 2 figs., 1950. 2*s.* 6*d.*

No. 39. STUDIES ON MICRO-FUNGI. VI. *Ceratosporium*, *Hirudinaria*, and *Hippocrepidium*. By S. J. HUGHES. 25 pp., 1 pl., 15 figs., 1950. 5*s.*

No. 40. REVISIONS OF AND ADDITIONS TO INDIAN FUNGI. III. By M. J. THIRUMALACHAR and B. B. MUNDKUR 15 pp., 16 figs., 1951. 4*s.* 6*d.*

No. 41. STUDIES ON MICRO-FUNGI. VII. By S. J. HUGHES. 18 pp., 6 figs., 1951. 5*s.*

No. 42. STUDIES ON MICRO-FUNGI. VIII. *Orbicula* and *Lilliputia*. By S. J. HUGHES. 27 pp., 1 pl., 12 figs., 1951. 5*s.* 6*d.*

No. 43. STUDIES ON MICRO-FUNGI. IX. *Calcarisporium*, *Verticicladium*, and *Hansfordia* (gen. nov.). By S. J. HUGHES. 25 pp., 1 pl., 6 figs., 1951. 5*s.* 6*d.*

No. 44. STUDIES ON MICRO-FUNGI. X. *Zygosporium*. By S. J. HUGHES. 18 pp., 9 figs., 1951. 4*s.* 6*d.*

No. 45. STUDIES ON MICRO-FUNGI. XI. Some hyphomycetes which produce phialides. By S. J. HUGHES. 36 pp., 11 figs., 1951. 10*s.*

No. 46. STUDIES ON MICRO-FUNGI. XII. *Triposporium*, *Tripospermum*, *Ceratosporella*, and *Tetraposporium* (gen. nov.). By S. J. HUGHES. 35 pp., 30 figs., 1951. 10*s.*

No. 47. STUDIES ON MICRO-FUNGI. XIII. *Beltrania*, *Ceratocladium*, *Diplorhinotrichum*, and *Hansfordiella* (gen. nov.). By S. J. HUGHES. 15 pp., 10 figs., 1951. 4*s.* 6*d.*

No. 48. FUNGI FROM THE GOLD COAST. I. By S. J. HUGHES. 91 pp., 32 figs., 1 map, 1952. 20*s.*

No. 49. STUDIES ON MICRO-FUNGI. XIV. *Stigmella*, *Stigmina*, *Camptomeris*, *Polythrincium*, and *Fusicladiella*. By S. J. HUGHES. 25 pp., 15 figs., 1952. 7*s.* 6*d.*

No. 50. FUNGI FROM THE GOLD COAST. II. By S. J. HUGHES. 104 pp., 49 figs., 1953. 20*s.*

No. 51. A SUPPLEMENT TO A LIST OF PLANT DISEASES OF ECONOMIC IMPORTANCE IN TANGANYIKA TERRITORY. By G. B. WALLACE and MAUD M. WALLACE. 7 pp., 1953. 3*s.*

No. 52. A HOST LIST OF PLANT DISEASES IN MALAYA. By A. THOMPSON and A. JOHNSTON. 38 pp., 1953. 10*s.*

No. 53. THE PLANT DISEASES OF NYASALAND. By P. O. WIEHE. 39 pp., 1 map, 4 graphs, 1953. 10*s.*

No. 54. THE RUSTS OF NYASALAND. By G. R. BISBY and P. O. WIEHE. 12 pp., 1953. 3*s.* 9*d.*

No. 55. LEAF SPOT OF ALEURITES MONTANA CAUSED BY MYCOSPHAERELLA WEBSTERI SP. NOV. By P. O. WIEHE. 4 pp., 1 pl., 1953. 2*s.* 6*d.*

No. 56. BRITISH SPECIES OF PERICONIA. By E. W. MASON and M. B. ELLIS. 127 pp., 1 pl., 43 figs., 1953. 30*s.*

No. 57. KEY TO THE SPECIES OF PHYTOPHTHORA RECORDED IN THE BRITISH ISLES. By GRACE M. WATERHOUSE and ELIZABETH M. BLACKWELL. 9 pp., 1954. 3*s.*

Numbers are issued at irregular intervals. Until further notice a rebate of 33⅓ per cent. is allowed on new Papers to those who register for all numbers as issued, the charge to subscribers to the *Review of Applied Mycology* being added to their subscriptions for the succeeding year, others being billed annually. A binding-case for Mycological Papers 1–25 is now available, price 5*s.*, postage extra.

ALL publications are post free and, with the exception of Mycological Papers, all subscriptions are payable in advance. Foreign subscribers should pay by International Money Order or through the British Agents of their Bankers. Orders and correspondence should be addressed to the DIRECTOR, COMMON-

CONTENTS

AUTHORS' NAMES

Adsuar, 762
Ainsworth, 759
Aldrich, 720
Amy, 762
Angelotti, 742
Arx, 760
Atkinson, 731, 734
Bailey, 738
Barnett, 768
Bashford, 746
Baxter, 724
Bayley, 747
Beaumont, 767
Beckman, 768
Benedict, 729
Bisby, 757, 760
Bolton, 737
Bombay, 767
Böszörményi, 763
Böttari, 739
Bremer, 743
Brook, 733
Brown, 742
Buchanan, 720
Bulman, 718
Buxton, 724
Cadman, 736
Carilli, 767
Carpenter, 753
Chamberlain, 731, 734
Chevaugeon, 757
Chilton, 734
Christensen, 719
Ciccarone, 708, 767
Cohen, 748
Conners, 709
Cowan, 759
Cullen, 729
Cunningham, 740, 760
Darrow, 737
Das, 740
Davidson, 749
Davis, 724
Delassus, 757
Delwiche, 763
Dement'eva, 736
Démétriadès, 713, 714
Dennis, 760
Desjardins, 764
Diachun, 765
Dickens, 724
Dickson, 727
Dimond, 766
Douglas, 745
Drake, 738
Drolsom, 727, 728
Dye, 736
Eide, 752
Endo, 756
Erwin, 730
Everton, 746
Ext, 752
Fedorinchik, 720
Filfus, 714
Fischer, 732
Fletcher, 742
Folsom, 736
Foster, 708
Foucart, 756
Fries, 749
Gagnotto, 725
Gainullina, 719
Gardner, 751
Garrard, 745
Gigante, 733, 764
Gilmer, 735
Goheen, 737
Gold, 717
Graniti, 739
Gray, 759
Grosso, 765
Haasis, 724
Hardison, 726
Hart, 715
Hawn, 722
Hawthorne, 732
Hepting, 768
Hilborn, 738
Hildebrand, 731
Horn, 732
Houston, 717
Hungerford, 735
Hunter, 731, 734
Hyre, 752
Ingold, 760
Jamalainen, 743
Jeffers, 744
Jewell, 768
Johnson (F. L.), 723
Johnson (T.), 718
Jones (K. W.), 719
Jones (L. S.), 735
Kahn, 764
Karling, 726
Kasperlik, 715
Kassanis, 725
Keener, 762
Keitt, 735
Keller, 722
Kelly, 743
Kendrick, 741
Kleczkowski, 763
Kljajić, 755
Kommedahl, 749
Kosikov, 745
Krenner, 721
Kroeker, 718
Kühner, 757
Kuntz, 768
Langdon, 727
Large, 726
Leach, 718
Loos, 762
López Matos, 762
Luc, 757
Lucas, 765
Ludwig, 740
Luttrell, 743
MacCarthy, 750
MacSwan, 708
Malenev, 752
Mandryk, 764
Martin, 740
Maxwell, 761
McGinnis, 718
McGlasson, 734
McKeen, 705
Melin, 747
Michaelson, 719
Middleton, 741
Miller (D. M.), 740
Miller (J. B.), 742
Miller (J. G.), 753
Miller (P. M.), 766
Miller (P. W.), 737
Minić, 734
Mollenhauer, 768
Moore, 735
Morrison, 747
Mulcock, 730
Müller, 760
Nattrass, 719
Nelson, 730
Newmark, 763
Nichols, 735
Niederhauser, 753
Nielson, 735
Nilsson, 747
Noble, 759
Norris, 750
Olson, 721
Onishi, 745
Orillo, 767
Oswald, 717
Özkan, 743
Padhi, 740
Pady, 743
Painter, 746
Pelletier, 738
Peterson, 744
Petrović, 734
Pettinari, 739
Pichler, 716, 718
Plakidas, 724
Portsmouth, 762
Potter, 722
Powers, 765
Price, 762
Quantz, 737
Ray, 733
Razvyazkina, 764
Resplandy, 757
Riccitelli, 742
Rich, 741
Richardson, 754
Riker, 768
Robinson, 723
Rodigin, 719
Romagnesi, 757
Rosa, 767
Rose (G. R.), 747
Rose (R. E.), 753
Roth, 768
Rout, 740
Samson, 721
Sanford, 749
Santilli, 748
Saperstein, 714
Sasser, 765
Savile, 709
Schatz, 742
Schneider, 763
Schober, 750
Senseney, 764
Sharp, 745
Shay, 731
Shumilenko, 717
Shurtleff, 728
Siang, 726
Sibilia, 716
Sidky, 748
Simmons, 761
Singh (B.), 720
Singh (R. S.), 720
Sinha, 720
Slykhuis, 717
Smith (C. B.), 768
Smith (W. W.), 731
Spina, 739
Srivastava, 720
Staffeldt, 745
Starr, 714
Stevenson, 754
Stević, 746
Stinson, 766
Struckmeyer, 768
Suneson, 717
Sussman, 749
Swabely, 715
Sylvester, 766
Szabó, 763
Takahashi, 763
Tammen, 723
Tarr, 759
Taylor, 765
Thijn, 753
Thomas, 723, 724
Thorn, 740
Thornberry, 733, 735
Thurston, 752
Todd, 751
Troutman, 765
Tyler, 716
Vanterpool, 722
Volcani, 738
Vučenović, 734
Wadsworth, 715
Waggoner, 766
Wakefield, 760
Walker, 747, 748
Wallace (G. B.), 719
Wallace (M. M.), 719
Warington, 755
Watson, 761
Weiser, 742
Welsh, 718
Wiles, 721
Wilkinson, 737
Williams, 731
Willison, 735
Wilson (J. D.), 742
Wilson (M.), 757, 759
Wiltshire, 708
Winstead, 724, 747, 7
Witsch 715
Yarwood, 748
Young, 715
Zentmyer, 738
Zeumer, 741

SUBJECT INDEX

Actinomycetes, 744, 745, 754
Antibiotics, 744, 754, 765
Bacteria, 713–4, 724, 731, 736, 738, 744
Diseases and disorders of:
- Apple, 731
- Cacao, 714–5
- Cereals, 715–9
- Citrus, 720–1
- Cotton, 721
- Fibre plants, 721–3
- Flowers and ornamentals, 722–6
- Fruit, 731–40
- Herbage crops, 726–31

Officinal plants, 755–6
Potato, 749–53
Rubber, 753
Tea, 762
Tobacco, 762–6
Tomato, 752, 764, 766–8
Trees and timber, 768
Fungicides, 721, 732, 740–2, 747, 768
General publications, 743–7
Genetics, 718, 724
Lists of fungi or diseases, 742, 757–9
Mycorrhiza and symbiosis, 747
Physiology, 743–4, 747–9
Reports from British Colonial Dependencies, 708; British Columbia, 708; Canada, 709; Costa Rica, 711; France, 706; India, 710, 711; Italy, 708
Soil and fertilizers, 718, 720, 729, 73
753–5, 762
Systematic mycology, 722, 726, 75
759–61
Technique, 742, 745–6
Virus diseases, 705–6, 717, 725, 73
734–5, 736, 737, 749–52, 762–4
Yeasts, 745

THE Executive Council of the Commonwealth Agricultural Bureau is a signatory to the Fair Copying Declaration, details of which can be obtained from the Royal Society, Burlington House, London, W.1.